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SELECTED ECONOMIC TRANSLATIONS

ON EASTERN EUROPE

(184th in the series)

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SELECTED ECONOMIC TRANSLATIONS ON EASTERN EUROPE

INTRODUCTION

This is a serial publication containing selected translations on all categories of economic subjects and on geography. This report contains translations on subjects listed in the table of contents below. The translations are arranged alphabetically by country.

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POLAND

Present and Future Production of Heavy Forgings in Poland

[This is a translation of an article by Ludwik Kelm in Hutnik, Vol XXVI, No 9, September 1959, Katowice, pages 366-368; CSO: 3633-N]

During the First World War the heaviest equipment used in forging was a 2,000-ton press in the "Baildon" Foundry and single-stroke hammers with dropping parts of 15 tons in the "Bankowa" Foundry. With this press forgings were manufactured from quality steel and steel alloys in the form of such items as rollers for cold-steel rolling, die parts, and ball-bearing rings, as well as a wide assortment of nonmagnetic rings for the electrical machine industry. The weight of the ingots did not exceed 12 tons, the hammers in the "Bankowa" Foundry forged a wide assortment of carbon steel pieces whereby the weight of the ingot reached 24 tons. The production assortment included shaft forgings, rollers for hot-steel rolling, stamping bars, connecting rods, and the like. These hammers, despite their overaged structure, worked all through the period between the two world wars and were removed from production only in 1957. In the period between the two world wars the domestic needs for heavy forgings were covered by imports from the countries whose capital was invested in Polish industry. Obviously, this state of affairs was not conducive to the development of heavy forging.

The rise of the COP [Central Industrial District] caused a change in this situation. During 1936 to 1938 presses of 2,500 tons pressure were installed in the Starachowice plants and in Stalowa Wola, which forged ingots up to 16 tons, making forgings for the armament industry and for general needs of the machine building industry. A change in the production assortment in the "Baildon" Foundry during this period also calused an increase in the weight of the processed ingots, which reached 16 tons and only after the Second World War grew to 20 to 22 tons.

During the occupation, the above-mentioned presses and hammers were used in production. Shortly before they capitulated, on leaving the Starachowice plants, the Germans dismantled the 2,500-ton press. The parts of the press were lost in transit. This press was never started again after the war. Only in 1946 was a new press of 2,000 tons pressure started in the "Batory" Foundry.

Our postwar experience has shown that the number of installations earmarked for the production of heavy forgings, as well as their production capacity, are inadequate for the needs of the steadily growing metallurgical, heavy machine-building, shipbuilding, chemical, and other industries. In 1952 in the "First of May" Foundry a press of 3,000 tons pressure was started, which makes forgings, from ingots up to 50 tons. The production of this press includes a rich assortment of ship forgings, such as steering shanks and shafts as well as rollers for mills that do hot-steel rolling, rings and cog wheels; connectors for crushers; anvils and the like. The installation of this press also made it possible for us, in cooperation with the "Baildon" Foundry, to master the production of nonmagnetic rigns for turbo-generators of 50 megawatts.

The further domestic needs for heavy forgings will be satisfied by the start, during this year, of a new heavy forgings press of 3,000 tons in the "Warsaw" Foundry. The press is constructed on the basis of Soviet designs and from Soviet deliveries. We foresee for this press the production of forgings from ingots of up to 50 tons, and particularly the following:

a) forgings of up to 30 tons with a maximum diameter of 1,100 millimeters and a length up to 13 meters, from nonplated carbon and alloy steels;

b) frogings from plated ingots of carbon steel up to 35 tons, whereby the maximum weight of the forging will be about 22 tons with a maximum diameter of 1,400 millimeters and a length determined by the weight--however, not exceeding 13 meters; from alloy steels up to 25 tons, whereby the largest weight of the forging will be about 15 tons with a miximum diameter of 1,250 millimeters and up to 13 meters in length;

c) rings with an external diameter of up to 3,000 millimeters and a height up to 500 millimeters, as well as sleeves of an external diameter up to 2,000 millimeters and up to 10 meters in length.

This program also includes the production of forging, that have so far been imported. This calss includes:

a) rollers for hot and cold steel rolling mills, chill molds for pipe-rolling mills, large die casts and the like for metallurgical needs;

b) steering shanks, forgings of shafts used in shipbuilding and other forgings needed by the shipbuilding industry;
c) rotors, rotor shields, turbo-generator shafts, rings from nonmagnetic steel for the needs of the turbo-generator industry;
d) rollers and convertors for the chemical and boiler industry.

The present productive capacities of the 3,000-ton presses are unable to satisfy the needs of the particular branches of industry for the heaviest forgings, which have so far been imported, and whose quantity improves from year to year. The continuously growing needs of the domestic industry for heavy forgings used in high power turbo-generator ensembles, heavy foundry rollers; forgings for large power ship engines; foundry machines; chemical apparatuses, and the like will be satisfied by the beginning of 1965 by means of a 6,000-ton press. This press-in agreement with the directives for the economic development of the People's Poland during 1959-1965, presented at the Third Party Convention in a speech by Comrade Stefan Jedrychowski, member of the KC PZPR [Central Committee of the Polish United Workers Party]--will be installed in the "Nowotki" Foundry in Ostrowiec.

In this press will be forged ingots of up to 150 tons, where the forging is done on nonswollen materials; in case of swell, the press will be able to handle ingots of about 60 tons of carbon steel or 45 tons of alloy steel. The heaviest forging, freely forged by means of lengthening, will be 95 tons; in swell forging the weight will correspond approximately to the weight of the swollen ingot.

The start of the 6,000-ton press will satisfy the needs for the heaviest forgings for the following industries:

a) metallurgical--rollers for crushers, resistance rollers for thin and heavy sheetmetal rolling mills, connector rings of an external diameter up to 5,000 millimeters;
b) power--forgings of turbine rotors and turbo-generator shafts of 120 and 200 megawatts, as well as the entire nonmagnetic rings needed for them;
c) shipbuilding--forgings for ship engines of high power (RSAD-76), including also crank shafts.
d) heavy machine-building--a rich assortment of forgings heavier than 20 to 25 tons apeace;
e) chemical--forged rollers for the production of methanol, ammonia, urea, etc.

The forgings that will be manufactured in the 6,000-ton press are depicted in Figure 1. [not reproduced]

As we see, the present heavy forging production capacity is based on presses of 1,000 to 3,000 tons. The proper development of this production branch, on a broader scale, started only in People's Poland. This is connected with plans for recasting the economic face of our country; this task gives priority to the need for starting heavy machine-building plants, particularly turbine and turbogenerator building plants, heavy metallurgical and mining machine-building plants, machine tool and chemical apparatus plants, as well as docks for shipbuilding. These rapidly developing industires are making very heavy demands on our presses. These require, in a few years, the mastery of techniques for manufacture of such important forgings as:

a) turbine rotors and turbo-generator shafts
b) turbine rotor shields
c) nonmagnetic rings of high durability requirements
d) mass production of tempered rollers for cold rolling of of sheet metal, including coated rollers
e) a rich assortment of ship forgings, including bent steering shanks
f) ovens for ammonia synthesis by the contact process, made of high-alloy heat-resistant steels, and many others.

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POLAND

Prospects of the Development of the Design of Turret Lathes

[This is a translation of an article by Marian Tutak in Przeglad mechanichny, Vol XVIII, No 24, 25 December 1959, Warsaw, pages 789-792; CSO: 3636-N/a]

The production of turret lathes in the postwar period was undertaken by the H. Cegielski Metal Industry Enterprises in Poznan. The design of two new types of turret lathes--the Rv32 (with vertical turret shaft) and the Rh32 (with horizontal turret shaft)--was initiated in 1946. They were launched into production in 1947 and have been manufactured without any basic design changes since. Eight more basic models were developed during the following years, accompanied by several closely related variants. Most of them are at present in serial production: a certain number have been produced, in limited quantity, on special orders; some of them never grew out of their prototype stage, while others are again in the testing stage or in development.

The experience of the H. Cegielski Plants in the construction of turret lathes is so extensive that they are in a position to undertake the production of the most advanced turret lathes, for the domestic demand as well as for export purposes.

The long-range plan for the expansion of the production of turret lathes has been worked out in conjunction with the general economic plans. This program calls for turret lathes (Rv) with vertical turret shafts for the machining of rods 12.5, 25, 40, 63, and 88 millimeters in diameter and (Rh) with horizontal turret shaft for rods 16 and 25 millimeters in diameter. All these types (type RVA 12 excluded) are expected to be manufactured by the H. Cegielski Plants. In connection with the above arose the necessity of working out the guiding principles for the production of turret lathes. The general outlines for this project have been carried out by the designing office of the HCP [N. Cegielski Plants?] Plants and included primarily the following problems:

[a] Principles for the determination of the characteristics of turret lathes and their accessories
[b] Outlines for future desings
[c] Study of the utilization value of presently designed turret lathes

Construction Materials

The selection of materials for the construction of turret lathes is determined by numerous factors--in the first place by their strength, resistance to abrasion, behavior in the process of thermal processing, and shape of the design element. The above factors have been taken into consideration in designing the turret lathes in question, whereby emphasis was placed on the durability of the elements and on reducing the number of rapidly wearing elements to a minimum. This is why steel alloys--chromium, carbon chromium-manganese-molybdenum, and (rarely) chrome-nickel--as well as thoroughly hardened chromium steels were applied for the helical gears of the main drive mechanisms.

Spindles made of steel alloys have surface of thoroughly hardened tips, which ensures the preservation of their dimensions within the limits of tolerance for many years. All other elements of drive mechanisms which are subjected to abrasion are made of high surface-durability steel or of high-quality bronze. Multiple couplings consist of alternate steel and durocupprum [copper with silicon additions] sheets, which ensure their stability and reliability in operation. The rings of cone couplings are made of synthetic materials --textolite and asbotextolite. The bed guides will be hardened by indu:tion, which will ensure them a long life.

A wider application of synthetic materials, as they become more available on the domestic market, is expected in the nearest future.

Present State in the Production of Turret Lathes and Future Design Prospects

At present the followingtypes of turret lathes are in mass production: Rv32, Rh32, RVA50, RVP100, RVL63, and RH25; the prototype RH16 is in development. The first two of the above mentioned turret types (already manufactured in 1947) will be withdrawn from production as soon as types RV40 and RV25 turret lathes are put into production, since these conform to the standard sizes adapted by the new program. Moreover, they would require modernization in order to increase the speed of the spindle. Type RV50 turret lathe was also withdrawn from production, because of certain design deficiencies.

The type RVP100 turret lathe (L.2) emerged as a simplified model of the previously manufactured type RV80/100. This turret lathe, in spite of its numerous advantages, will in time be replaced by a new type of same diameter.

Type RVL63 (L.3) (in production since 1958) is characterized by simple construction, modern features, and easy operation. Its features include preselected spindle speed control, automatic turret turning, accelerated automatic saddle feed, and a number of other advanced design features. Furthermore, it is characterized by low weight and a low weight-to-power ratio. The above turret lathe can be perfectly applied for the machining of rods as well as for light-duty chuck operations; however, its application for very heavy-duty chuck operations is rather limited. This turret lathe will be subjected to certain improvements and its production will continue.

This year saw the beginning of the production of the type RH25 (L.2) turret lathe, whose design is based on new outlines and which will be manufactured without any basic changes, except that a three-speed reversion motor was applied to simplify the switching system. The prototype of the type RH16 turret lathe is at present under study. The latter is provided with an original electrical system, with which the two-speed continuous-duty motor could be adapted for reverse operation, with a possibility of changing the speed and direction about 300 times per hour. The above machine is to undergo tests, whereupon it is expected to be launched into serial production as the smallest of the planned variety of models.

At present the type RV40 turret lathe is in development. This machine will have completely advanced features and a number of original design characterisitcs, let alone the fact that it will be simple in execution and installation. It will be first constructed with hydraulic preselection of speeds and feeds, then as a variant with electrohydraulic programming controls, and finally as another variant with the possibility of operating semi- or fully automatically, controlled by adjustable stops with the aid of an electrohyraulic system.

The above variants (especially the first and the second) will be closely unified.

Next is foreseen the design of the type RV25 turret lathe, whose main drive will be unified with the drive of the type

RH25 turret lathe, and whose design will approach that of type RV40. Subsequent plans call for the desing of types RV80 and RV100 turret lathes, except that they will be closely unified. However, the first of them will be designed for rod as well as chuck work and the second one especially for heavy-duty chuck operation. And finally, a heavy-duty variant will be developed of the type RV63 turret lathe, more rigid and powerful than type RVL63, thus with better possibilities of carrying out heavy-duty chuck operations.

The plan of construction of advanced types of turret lathes will be carried out after all the above-mentioned new types have been launched into production and the obsolete models withdrawn.

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POLAND

Achievements of Domestic Industry To Date in Production of Internal-Combustion Locomotives

[This is a translation of an article by Jan Wiodarczyk in Przeglad Mechaniczny, Vol XVIII, No 24, 25 December, Warsaw, pages 783-795; CSO: 3636-N/b]

The production of internal-combustion locomotives in Poland was initiated before the First World War at the them operating First Locomotive Plant at Chrzanow (known as "Fablok") based on cooperation with the Kloeckner-Humbuldt--Deutz AG firm.

The first internal-combustion locomotive manufactured at the "Fablok" in 1932 was a narrow-gauge, two-acle, type 2 DK, 26/28 horsepower, mining type of locomotive designed for the "Brzeszcze" coal mine.

Up to 1939 the Chrzanow Plant produced a total of 41 loco motives (13 models), ranging in capacity from 40 to 200 horspower. In 1936 the Chrzanow Plant produced five motor cars [trolleys?] (so-called Luxtorpedo) with Austro-Daimler internal-combustion locomotives and Voith type hydraulic gear mechanisms.

In addition to the above-mentioned equipment the Polish industry--represented in this branch of production by the H. Cegielski Plant in Poznan; Lilpop, Rau, and Loewenstein in Warsaw, Ostrow Plant; its Warsaw Branch (former "Parowoz" Corporation); and the Chrzanow Plant--produced several tens of motor cars for the PKP [Polish State Railroads[, whose internal-combustion engines were partly imported and partly of domestic production. Although the gear mechanisms were generally i ported, the Ostrow Plant supplied a motor car which, together with its engine and gear mechanism, was designed and produced at that plant.

After the High-Compression Engine Plant at Andrychow completed (in 1948-1950) the type S64L internal-combustion engine--capacity 40/44 horsepower, speed 1,200 revolutions per minute--the "Fablok" Designing Office worked out technical specifications for the type WLs40, narrow-gauge, internal-combustion lcomotive--capacity 40 horsepower, with "blind" shaft transmission. The prototype of this locomotive was produced at the Warsaw Industrial Equipment Plant. After testing the prototype and eliminating minor deficiencies, the serial production of these locomotives was entrusted to the Railroad Rolling Stock Repair Shop in Poznan. So far, about 800 of these locomotives have been produced.

In 1951 the "Fablok" Plant prepared technical specifications for the type Ls40 standard-gauge, internal-combustion locomotive, designed for transfer operations in small industrial plants. This locomotive, simple in construction and easy to operate, is equipped with the same internal-combustion engine and four-speed gear mechanism as the type WLs40 locomotive. The power from the engine is transmitted to one of the axles with the aide of a helical gear mechanism. The two axles of the locomotive are connected with a frame. Over 450 such locomotives are employed by the industry.

In connection with the order for internal-combustion locomotives placed by Korea (with the "Metalexport" in 1954), the "Fablok" prepared technical specifications for a locomotive based on design data of the type WLs40 locomotive. The ordered locomotive was to be adapted for tracks 750 millimeters wide. In this way a new type of internal-combustion locomotive (2WLs40), belonging to the locomotive group equipped with type S64L internal-combustion engines manufactured by the Andrychow Plant, was created.

In 1957, parallel with the production of a 75-horsepower internal-combustion engine at the Andrychow Plant, the "Fablok" designing office proceeded with the preparation of technical specifications for the type Ls75, 75-horsepower internal-combustion locomotive (Figure 1). The prototype of this locomotive, produced at the "Fablok" Plant in 1958, was handed over for use to the PCN [Petroleum Products Center[in Wroclaw in February 1958. In view of the fact that the type Ls 150, 150-horsepower internal combustion locomotive was being constructed at the same time, the type Ls 150 locomotive, thus oversized for the type Ls 75 locomotive. However, this was a necessity in order to avoid the simultaneous construction of two gear box prototypes under the difficult conditions which prevailed at the "Fablok" Plant in connection with the initiation of the production of helical gear mechanisms.

The prototype series of type 2Ls75, 75-horsepower internal-combustion locomotives, now in production, has (compared with the original prototype) a number of design changes, the most important of which is the application of a hydraulically controlled three-speed gear mechanism, designed for a maximum capacity of 100 horsepower. The above gear mechanism permits the use with this type of locomotives of 110-horsepower six-cylinder engines, whose prototype is at present under construction.

The type 2Ls75 internal-combustion locomotive is provided with the following equipment: air-brake assembly; auxiliary air brake with 750-liter per minute compressor; two-way pneumatic sending gear; electrical lighting from storage batteries supplied from a spearate dynamo; heating system (combustion fumes); engine speedometer; remote thermostat for measuring the water temperature in the radiator; manometers for measuring the oil pressure in the engine, gear box, and hydraulic steering system; dynamo amperemeter; and a light signaling system. The gear mechanism permits forward and backward motion. The indicator apparatus is assembled on a common console, which at night is sufficiently illuminated.

The gear box contains a hydraulically steered three-speed gear mechanism. The gear box is steered from posts located on both sides of the cabin.

In 1958 the "Fablok" Plant Designing Office prepared the documentation for the type Ls150, 150-horsepower internal-combustion locomotive with type DSR 150 six-cylinder internal-combustion engine, produced at the M. Nowotki Machinery Plants in Warsaw. The prototype of this locomotive (Figure 3) was exhibited at the Twenty Eighth International Poznan Fair. A prototype series of these locomotives will be produced before the end of this year. The prototype, as well as the serial group of these locomotives, are provided with four-speed automatic gear mechanisms and are steered hydraulically from the engineer's cabin, (Figure 4). The above gear mechanism makes possible speeds up to 25 kilometers per hour, which is quite satisfactory for switching operations. For switching operations requiring rapid maneuvering of the locomotive from one place to another, the construction of these locomotives with tso-range gear mechanisms(two to four speeds), that can develop speeds up to 45 kilometers per hour is planned (in 1960). The type Ls150 locomotive is equipped with the same type of equipment (devices and control apparatuses) as the type 2Ls75 locomotives, except that the former is provided with a water-heating system.

The next internal-combustion locomotive type which is being designed at the "Fablok" Plant is the type WLs150, 150-

horsepower, three-axle, narrow-gauge locomotive for tracks 750 millimeters wide, (Figure 5).

The type Ls 300 internal-combustion-electric locomotive is the largest internal-combustion locomotive ever manufactured in Poland. The technical specifications for the above locomotive were prepared by the Central Rolling Stock Industry Designing Office in Poznan in 1955, while its prototype was produced at the "Fablok" Plant in 1956. After a series of thorough tests, carried out by the Central Institute for Research and Development of Railroad Engineering and the Institute of Electrical Engineering (during the fourth quarter of 1956 and the first quarter of 1957), the "Fablok" Plant Designing Office did the final redesigning of type Ls 300 locomotive (Figure 6).

Owing to the shortage (applicable for this type of locomotives) of hydraulic gear mechanisms of domestic production or other adequate gear mechanisms, the Ministry of Railroads set the condition that the locomotive in question must be provided with an electrical gear mechanism, which although more expensive, ensures a more advantageous traction feature. Furthermore, the locmotive was supposed to be formed of basic assemblies manufactured in Poland, such as the internal-cmbustion engine, main dynamo sand traction motors.

Thus, the following assemblies were applied in the production of the type Ls 300 locomotive: type VRoca 300, 300-horsepower, 1,500 revolutions per minute, internal-combustion, high-compression engine, manufactured by the M. Nowotki Machinery Plants in Warsaw; 220-kilowatt, 600-volt, 370- ampere (PCOM-186a spec) main dynamo, produced by the Electrical Machinery and Transformer Plant in Zychlin, and four 60-kilowatt, 860-revolutions per minute, 600-volt, 113-ampere traction engines manufactured by the M5 Plant in Wroclaw.

After the first few locomotives of this type were tested in operation, the main dynamo was redesigned in order to increase its durability under traction conditions.

In the middle of this year, three locomotives constructed in this manner were tested by the COB and RTK [not identified] as well as by the Institute of Electrical Engineering. The gear mechanism of these locomotives consisted of the modified main dynamo, driven by the internal-combustion engine by means of a "Priflex" type flexible coupling or flexible coupling with rubber rings.

The previous observations of the type Ls 300 locomotives in operation with the modified dynamos, as well as studies conducted by vaious institutes, indicate that the production of this type of locomotive will develop in favor of domestic users and perhaps for foreign buyers too.

The production of internal-combustion locomotives in the past few years was undertaken by the M5 Building Equipment Repair Establishments in Gliwice.

The above establishment, which has been engaged in the repair of internal-combustion locomotives for a number of years, had the opportunity of familiarizing itself with the design of various types of locomotives, of learning their shortcomings and advantages, and consequently of preparing for their production. Making use of their experience, the designers of that plant prepared specifications for the following two types of locomotives (with high-compression internal-combustion engines produced by the Andrychow Plant):

[a] type GLs20, 25-horsepower, narrow-gauge, internal-combustion locomotive with type PS322, 25-horsepower, 1,000 revolutions per minute, two-cylinder, internal-combustion engine with three-speed automatic gear mechanism;
[b] type GLs70E, 75-horsepower, narrow-gauge, internal-combustion locomotive with type PS324,, 75-horsepower and 1,500 revolutions per minute, four-cylinder, internal-combustion engine with electrically operated gear mechanism, consisting of a 50.5-kilowatt and 1,450 revolutions per minute main dynamo (type PBa 84b compound, 230 volts, 233 amperes), and two 23-kilowatt and 660-revolutions per minute traction dynamos with series characteristics (type LD-030, totally enclosed, 220 volts, 120 amperes).

Furthermore, the Gliwice Plants contemplate the production of narrow-gauge, internal-combustion locomotives of capacities ranging from 9.5 to 100 horsepower.

Thus we can see that the domestic production can be credited with certain achievements in the construction of internal-combustion locomotives. The start for the full development of this production is well behind us. The further development of the rolling stock industry, and especially that of the construction of high-capacity internal-combustion locomotives, will depend upon the development of other equipment required for that purpose--namely, internal-combustion engines, electrical and hydraulic gear mechanisms, and adequate electrical apparatuses.

Figure Captions

Figures 1 and 2 (photo and diagram): Type Ls75 internal-combustion locomotive.

Figures 3 and 4 (photo and diagram): Type Ls 150 internal-combustion locomotive.

Figure 5. (diagram): Type WLs 150 internal-combustion locomotive.

Figure 6 (photo): Type Ls 300 internal-combustion electric locomotive.

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POLAND

Description of the Construction of Polish-Made 216-Millimeter Diameter Drill Bits

[This is a translation of an article by Jozef Werynski and Zbigniew Nowak in Nafta, Vol XV, No 12, December 1959, Katowice, pages 334-341; CSO: 3671-N]

The domestic production of drills and drill bits for rotary drilling was started seven years ago in the FNW [Factory for Drilling Equipment], formerly the Drill-Bit Factory, in Kracow and in the FMiSW [Factory for Machines and Drilling Equipment] in Glinik Mariampolski. This production freed our domestic drilling operations from the need to import these tools; nevertheless, the new production, as well as the overhaul of worn out drills and bits, carried on in the first years in the former Drill-Bit Factory, did not satisfy qualitatively the demands of our drilling operations, which arise from a desire to achieve technical drilling coefficients close to those abroad.

In 1957, therefore, we worked out for both domestic factories a new uniform construction design for drills and drill bits; the so-called overhauling was completely abandoned and the technical processes were improved and carried out more precisely (particularly heat processing) and better production control was instituted. In adapting to the needs of the domestic users we started this program first of all with the production of "tri-bit" drills of the T, S, M, and BM types, with dimensions of 216, 308, and 143 millimeters in diameter, as well as "hexa-bit" core heads of the T type of the same diameters. As a result, there was a definite improvement in 1958 in the quality of the drills as well as the drill-bit core heads. On the basis of the statistics collected by FNW from the oil-well drilling and mining industries concerning the 216-millimeter diameter bits produced by this factory, we must conclude that the basic average coefficient of meters drilled by one drill (compared to its total utilization) increased 50 to 200 percent for all types of drills made in 1958, depending on the type of drill, as compared to those made in 1957 and previously, whereas for the core heads the increase was from 50 to 100 percent. At the same time the coefficient of mechanical drilling velocity for these drills and core heads improved too.

The quality of the 216-millimeter diameter drills and core heads of FNW production equals and sometimes even surpasses that of such foreign products as those of Czechoslovak, Austrian, or Soviet made of previous years. On the other hand, it continues to be poorer than the American products or those of other Western companies. And although it would be possible to achieve certain positive effects in this area through further improvements in manufacturing techniques, the desired improvements require more radical means. It must be emphasized that at this moment we are not as much concerned with core heads--which do not cause the users any great troubles with the techniques now used--as we are with the drill bits. (The case of core heads, which includes other technical constructional problems, will be discussed separately later).

In connection with the above in the first half of 1959, the Factory for Drilling Tools in Kracow worked out the construction and technology of a new manufacturing method for 216-millimeter diameter drilling bits of all types, on the basis of their own surveys and investigations of used and new drills of domestic and foreign make as well as on the material and technical tests of foreign drills carried out in the Materials Testing Shop of the Silesian Polytechnic and partially in the Stalowa Wola Foundry.

In the light of these test results, the following can be said:

1. The steel types so far used for particular drill units do not warrant any fundamental reservations with respect to quality in comparison with those used in foreign manufacturing, and the additional materials introduced in the new manufacturing method can be found in the assortment of steels produced by our mills.

2. The weakest link of the drill in the present manufacture is the bearing assembly of the bit, which wears out considerably faster than the cutters of the bit, wherein this premature wear starts at the slip-bearing. Therefore, in the new manufacture we must first of all change the construction and technique of the bearing assembly.

3. The present construction has certain shortcomings in the assembly and geometry of the bits and their cutters that negatively affect the durability of the cutters as well as the bearing assembly of the bits; therefore, in the new manufacture these errors will be removed, in line with American manufacturing methods.

The new manufacture of drilling bits--in the meantime of 216 millimeter diameter--is based on the following assumptions:

I Materials

The drill stem and the bearing peg, so far manufactured as a uniform ide forging from steel type 18 HGM or 18 HGMA respectively, obtains--after carbon treatment and the proper heat process-the following mechanical core properties: Rr - 110 kilograms per square millimeter; Rpl - 90 kilograms per square millimeter; a_5 - 10 percent; c - 50 percent; and U - 9 kilograms per square centimeter. The hardness of the carbon treated layers on all bearing grooves has a minimum of 60 Hrc [not identified]. In the past year the FNW also made certain drills (of 216 millimeters in diameter) with stems of 12HN2A and 12HN3A steel, which, although giving lower mechanical properties (Rr 80 and 95 kilograms per square millimeter; Rpl-60 and 70 kilograms per square millimeter respectively) were more convenient and steadier during the heat processing. No qualitative differences were observed in the work of the drills, between the above-mentioned nickel-free of nickel-containing steel stems that would warrant the use of considerably more expensive grades with the addition of nickel, which we are short of.

Our investigation showed that the stems of foreign made drills are constructed--even in the same factory--from various grades of steels, which would correspond to our grades as follows: 18HGMA, 14 HN, 20 with the addition of Mo [Molybdenum], and even 45 with the addition of Mo. In the case of the last two grades, the mechanical properties of the core stem are considerably lower than those obtained from the grades we have used so far. In the 45 grade the hardening of the bearing grooves is achieved through surface hardening and not through carbon treatment.

Considering the above as well as the durability calculations of the bearing peg when, in the new manufacture, the diameters of particular grooves will be increased and greater pressures on the drill will be allowed according to the recommendations of the foreing factories--and furthermore in order to obtain better heat processing conditions than with the 18 HGM steel (which has a relatively high carbon content)--we foresee in the new manufacture the use of a chrome-manganese-molybdenum steel of grade 15HGM for the stems. After the carbon treatment and the proper heat processing mwe obtain for the core the following minimum properties: Rr - 90 kilograms per square millimeter; Rpl - 70 kilograms per square millimeter; a_5 - 12 percent; c - 45 percent; and U a minimum of 8 kilograms per square centimeter; the hardness of the carbon treated layer is over 60 HRC. Obviously, the 12HN2A and 12HN3A steels continue to remain similar; however, their use here is not justified either economically or technically. On the other hand, the permissible uses of 18 HGM and 18 HGMA steels (which are on the borderline of steels for heat process improvement) are replaced by 15 HGM steel, which is superior with respect to heat processing conditions of the stems.

For the drill bits so far made from forgings of the same steel (18HGM and 18HGMA) as the stems, and similarly heat-treated except for the process that hardens the bit cutters, the FNW also used chrome-nickel steels 12HN2A and 12HN3A and did not find any qualitative differences in the work of the drills, except for the fact that the latter lent itself to an easier and surer heat processing.

The foreign drills examined had bits made of steels corresponding, according to the PN [Polish Standards], to grades 20HN3A and 14 HN, respectively, of nickel steels (about 3 percent nickel), and of steel for carbon treatement (about 0.2 percent carbon) with an addition of molybdenu, which has no corresponding grade in the Polish Standards.

An analysis of the mechanical properties of these steels, after heat processing, when compared wih the durability calculations made on the bit and its cutters, leads to the conclusion that the 15HGM grade of steel is adequate for making bits in the new manufacture. Nevertheless, the FNW will also carry out test with bits of 12HN2A and 12HN3A steels in order to check the degree to which the above-mentioned grades can improve the quality of the drill cutters and whether it will be justifiable to use more expensive steels containing nickel, which is in short supply.

The bearing bollers will continue to be made of LH15 steel. They assure the best mechanical properties of the drill roller-bearing units. In foreign manufacture--even in the leading factories--they use lower grade steel, similar to the PS1 grade (spring steel) for rollers. The one case where it was found upon examination that they used 50HN steel for rollers is not suffient basis for switching to this grade, which is inferior, with respect to elasticity, to LH15 steel.

Ballbearings, domestically made from LH15 and abroad from PS1, leave no reservations.

The stoppers that seal the ball-bearing openings (in the stem)--because they are processed mechanically and thermally together with the stem--will continue to be made of the same steel as the stem. In foreign makes--even very good ones--second grade steel, carbon steel, is being used for this unit. We find in the assortment produced by the domestic foundries the materials for the new elements of the drill as given in the description of the new manufacturing method.

Resistance stoppers in the bit (eventually also in the slip peg of the stem) can be made of high cutting steel, of steel alloys used for instrumentation, or of LH15 steel. Sleeves for the slip-ring bearing in the bit may bemade of a high percentage chrome-alloy steel with a carbon coated inner layer.

The stem slip-peg around the circumference and from the face can be plated with either stellite-like material (PNS [Polish steel standard] rods or stellite 1 electrodes) or with special electrodes for welding alloy steels.

Nozzle jets for the drilling mud will be made from fused tungsten carbonates in ready-made forms, and until we obtain them we may use alloy steel carbon coated from the inside and properly heat treated.

The materials for the new elements of the drill must have first of all a high resistance to friction. With respect to some of the grades given above, the FNW will carry out tests in order to select from among them those that will prove to be technically and economically the most suitable.

In order to obtain from the described materials, for each element of the drill, their best mechanical and structural properties according to the conditions under which they will be used, the following is required:

1. We must obtain from the foundries a starting material which is qualitatively completely reliable.

2. The processes of the prescribed heat treatment must be carried out properly.

3. The properties obtained in the course of the production processes must be faultlessly checked.

1) The FNW ensures good quality metallurgical products for drills--in the form of forgings and bars--by having these materials checked in the foundry by representatives of the mining and metallurgical academies, independently of the checks made by the Technical Control Service of the foundry.

2) In the field of heat processing, the FNW has adequate means and methods of assuring the proper results of these processes. Carbonation in particular is carried out in natural gas (by a muffle system in gas furnaces); tempering, dissolving out of materials, as well as white-heat treatment are carried out mainly in electric furnaces and also in salt baths, whereby the temperature readings in the furnaces are centrally registered and the electric furnaces have automatic temperature regulation.

3) In heat processing as well as in mechanical processing a very detailed inter-operational control is used besides the final check, which is 100-percent effective for the main elements of the drill.

The results of each heat operation are checked not only by measuring the hardness but partially also by an investigation of the macro- and microstructure, and in warranted cases --periodically--also by checking the mechanical properties. The above investigations are carried out either on units picked from the lot or--mainly in carbonation--on special control samples.

Comparison tests were carried out on the main elements of the test lot of drills made by the new manufacturing method, and the results were compared to si ilar drill elements of foreign make.

II. The Bearing System of the Bits

Investigations and surveys of used drill bits made by FNW according to present manufacturing methods show premature wearing out of the bit-bearing system with respect to its cutting edges. This is the cause of the short service life of the drill. An analysis of this occurrence leads to the following findings:

1. The bearing arrangement of the drill bit, consisting of three elementary diagonal bearings--a roller bearing, a ball bearing, and a slip bearing--does actually not contain a longitudinal bearing element; although the shape of the ball-bearing system can absorb some longitudinal loads, it does so to a limited extent. Meanwhile, this ball-bearing system must fully withstand relatively large forces that appear during the work of the drill along the bit axis; therefore, it is worn out rapidly in the longitudinal direction, causing the premature appearance of loose spots and destruction of the balls and consequently bad performance of the entire bearing system.

2. The diameters of the elementary bearings are too small, not so much with respect to the durability of the peg in dangerous cross-sections as because of the unit pressures which lead to rapid wear in this part, since the peg works only at the lower part of its circumference.

3. The loads transferred by the bit onto the bearing peg are most dangerous for the slip element since the latter, by the nature of its work, has the worst surface friction conditions in relation to the two other bearing assemblies. Therefore, the resitance to friction of the slip bearing assembly, obtained by carbonation and heat treatment of the peg and bit, appears to be too small in relation to the other two bearing assemblies, and the slip bearing element therefore wears out faster than the others, giving rise to the destruction of the entire bearing system.

Therefore, in the new manufacturing method the bearing arrangement was left as is; however, the slip bearing construction was changed as follows:

1. In order to free the ball bearing assembly from longitudinal oads, a resistance stopper was introduced into the bit that works in assembly with the face area of the slip peg. Construction tolerances were retained, so that the ball bearing assembly transfers almost no axial forces.

2. The diagonal and partially also the longitudinal dimensions of the bearings were increased to the possible maximum; thus the quantity of contact elements--that is, rollers and balls--was also increased, as shown in Table 1.

3. In order to increase the resistance to friction, the slip peg was plated on its circumference as well as on its

face with a stellite-like material. Into the slip bearing of the bit was introduced a funnel-shaped pump (tulejka), very resistant to friction (with a surface that works jointly with the peg).

Table 1

A Comparison of the Basic Dimensions of the Bearing System of the 216 Millimeter Diameter Drill in the Present and New Manufacturing Method

Description	As Manufactured Now	New Method
Diameter of the roller bearing ring in the stem (millimeters)	44.8	50.8
Diameter of a bearing roller (millimeters)	10	10
Length of a bearing roller (millimeters)	20	22.4
Number of bearing rollers	17	19
Diameter of the ball bearing ring in the stem (millimeters)	32.8	41
Diameter of a bearing ball (millimeters)	12.7	12.7
Number of balls	11	13
Diameter of the slip peg in the stem (millimeters)	20	24

Increasing the bearing dimensions in the dangerous cross-sections will also permit--as durability calculations show--the use on the drill of loads about 45 percent greater is permissible under the present manufacturing method. This will provide us the possibility of using for our drills drilling parameters recommended by Western foreign manufacturers and required in modern drilling techniques.

The durability of the bearing system is influenced--outside of its construction--by the degree of resistance of its elements to friction, depending upon the size of the surface area that takes part in the work of the bearing. Resistances to friction should be inversly proportional to the size of the surfaces, which leads in the case of drill bearing systems to the following gradation: the bearing rings of the peg should have the greatest resistance; the bit rings a lesser amount; the balls and rollers the least. The justification of this principle can be confirmed by surveys of the bearing elements of worn out drills. Although no consideration was given to the above gradation in the present drill design, the FNJ nevertheless introduced the discussed gradation year.

In practice, a hardness gradation according to the above given principles is used.

The present hardness gradation was retained in the new manufacturing method for the ring bearing contact points, as well as for the balls and rollers; on the other hand, for the elements of the slip resistance bearing the criterion will be not the hardness but the resistance to friction, which will be greater than for the contact bearings and will be ensured through the proper choice of materials and heat treatment.

The polishing of the ring bearings of the bits as well as the stem peg will be continued in the new manufacturing method. This is done not only to obtain smooth rings for the bearings but mainly in order to remove eventual deformations that appeared during the heat processing. Although some foreign manufacturers do not polish the stem pegs, they do have isothermal conditions for heat treatment of stems where there is no danger of deformation, whereas we do not have such conditions.

III. The Arrangement and Geometry of the Bit Cutters

The bit cutters, which are primarily responsible for the nature and effects of the drill work in the drilled hole, are generally more durable than their bearing system, according to the present drill manufacturing method of the FNW. However, by analyzing the construction of foreign bits and keeping in mind the rate of wear of cutters on domestically made drills, we arrive at the conclusion that we must introduce in the new manufacturing method a number of structural and technical cahnges in the cutter system which will further increase its durability and assure better working conditions for the drill.

The arrangement as well as the geometry of the bits and their cutters differ for various types of drills--that is, for the various rocks drilled.[1] Inasmuch as in hard formations where the bit cutters bite into the rock and crush it or chip it, we strive to achieve as clean as possible a turning of the bits at the bottom of the hole (without slipping), in soft rocks, where the cutting action is rather of a slicing nature, we strive to obtain additionally a slipping of the bits--the lower the rock resistance the larger the slipping. These requirements are met by the proper arrangement of the bits with respect to the drill axis as well as through arranging the bits according to a proper cone or by adding one or two auxilliary cones--which is also connected with the self-cleansing of the cutters and with covering the hole bottom.

We have shown in Figures 3 to 5 [not reproduced] various bit arrangments with respect to the drill axis, utilizing various cones to form the bit thus: Figure 3 depicts bits of a true cone whose axis passes that of the drill and whose apex also lies in the axis of the drill. Theoretically, a clean turning occurs here without slipping. The cutters are not self-cleansing. Figure 4 depicts bits with one auxiliary cone with the axis passing the axis of the drill, but the apexes of the cones lie outside of this axis. The arrangement permits self-cleansing of the cutters. An insignificant slip occurs here alongside the turning.

Figure 5 depicts bits whose axes has been moved with respect to the drill axis and where one auxiliary cone has been used. This arrangement is of use for self-cleansing bits and it also permits an increase in the slipping value.

So far, the T type drills have been mnufactured in an arrangement as given in Figure 3. The S, M, and BM types were made in an arrangment as given in Figure 4.

In the new manufacturing method--according to American patterns--we used for type T and arrangment as in Figure 4 and for types S, M, and MB an arrangement as given in Figure 5, with the proviso that the shift of the bit axis with respect to the drill axis differs for each type and that two auxilliary cones were used. The bit arrangement for the type T drills, with slight slippage, was decided upon because the arrangement given in Figure 3 would not have allowed the reinforcing of the bearing system and this reinforcing has a greater value for the improvement of the drill T quality than the losses due to slippage.

The introduction of the shift in the bit axis with respect to the drill axis also allowed a rise in the coefficient of hole bottom coverage in some types of drills. Thus, for example, with the present manufacturing methods, for types S and M $\eta \sim 1$ and in the new manufacturing methods for these types $\eta \sim 1.2$.

The external shape of the bits in the new manufacturing method was changed not only by introducing two auxiliary cones but also by differentiating the apex angles of the right cone for the particular types of drill. For example, for the types S, M, and BM this angle was equal to 90 degrees; now the angles are (in the given type order): 83, 88, and 92 degrees. The apex cone angles of the auxiliary cones were also differentiated, for various types of drills.

As a result of these changes, the bits assumed a more barrel-like shape. Such a shape makes it possible, on the one hand, to obtain adequately thick bit walls between cutter notches and bearing rings, and on the other hand it influences the bearing work favorably, because the force distribution transferred during the work of the drill by the bits to the bearing will now be more uniform.

In bit geometry the angle γ formed between the horizontal plande and the cone is also important. In order to obtain better drilling effects, this angle should vary for different types of drills. In hard formations one strives for rectlinear curring action in order to obtain the greatest tensions and thus overcome the rock resistance, thus we would like the smallest γ angle. In soft formatinns where such great tensions are unnecessary, the γ angle should be larger in order to achieve better guidance of the drill during its work. The size of this angle was graduated, in the new manufacturing method, for each type of drill, from 7 degrees for type T to 14 degrees and 30 minutes for type BM. Whereas in the present manufacturing method the angle was the same for types S, M, and BM and amounted to 12 degrees and 30 minutes.

A very important problem in the work of a drill is the possible maintenance of a constant diameter of the drilled hole over the entire drilling operation. Rapid wearing out of the bits at the points of contact with the hole wall--that is, at the face cone--causes a loss in the drill diameter and in the hole diameter. This in turn requires widening of the hole, which reduces the drilling progress and is very damaging to the newly lowered drill. In order to avoid this, we introduced the following into the new manufacturing method as is done abroad:

1. We assured a linear contact of the bit face cone with the hole wall.

2. We changed the shape of the bit face cutters and reinforced them with hard metals.

1) The shape of the bit face, for such an assumption, can be determined either graphically or analytically. A detailed presentation of this problem would be too extensive and does not fit into the context of this article; we therefore present this problem only in a cursory manner. From the diagram (Figure 6 [not reproduced]), where for the sake of simplification we showed a bit with a regular cone with its axis passing through the axis of the drill and its apex beyond the drill axis, it may be seen that the bit at the larger diameter of the face cone (d_1), touches the well bore at two points--C and D; on the other hand, point B, which is a trans-section of this diameter by a plane passing through the axis of the bit and drill, is at a certain distance (e) from the well bore. Properly selecting the smaller diameter of the face cone (d_2) so that it touches the well bore at one point (A), we assure linear contact of the bit cone with the well bore during the operation of the bit (in this case, on two curves (AC and AD) that lie on the laternal side of the face cone). In fulfilling this condition it happens that angle β is greater than angle α ; thus the angle between the face cone and the well bore is: $\delta = \beta - \alpha > 0$. (In the case of a bit where the axis is shifted with respect to the axis of the drill, the above explanation remains the same except that the diagram in Figure 6 will be properly shifted.)

In the present drill manufacturing method the angle $\delta = 0$. Thus the bit touched the well bore during the drill operations at a point. This was one of the main reasons for the premature loss of the drill and well diameter. We have made the angle $\delta > 0$ in the new manufacturing method whereby its value varies for different drill types, from two degrees ten minutes for type T to eight degrees and 30 minutes for type BM.

2) Independently of the above, the proper shaping and reinforcement of the bit face cutter that works on the wall contributes to the protection of the drill diameter. This has great significance, particularly for the T and S types. Therefore, we introduced into the new drill manufacturing method other design solutions, namely:

[a] For type T according to Figure 7, the external cutter arrangement in the form of the letter T.

[b] For type S according to Figure 8, the external cutters are arranged in the form of the letter L. Both figures

[not reproduced] show strong reinforcement with hardening materials of the face cutters.

The shape of the remaining cutters and their distribution in particular bit arrangements for drills of various types do not require any detailed discussion; however, as a result of the above described construction changes as well as the analyses of foreign samples, certain changes were made as compared with the present construction, but these are not fundamental changes.

The durability of the bit cutters as well as the drilling effect also depends to a large degree on the method of plating the cutters with hardening metals and upon the properties of these metals, particularly on their hardness and their resistance to abrasion. As investigations revealed that in the American drills the plating layers of the bits contained poured carbon grains or tungsten particles of very great harness, about 3,000 HV [hardness-value] and in the softer coating (400 to 450 HV), the Soviet manufactured bits have in the corresponding layer only traces of boron and mainly tungsten carbonate of a hardness of 1,500 to 1,600 HV (in a content similar to the American one). On the other hand, the domestic rods used by us for plating PNT [not identified], which contain tungsten carbonate grains, give a grain hardness close to the Soviet one but considerably lower than the American ones and also fluctuating within wide limits--even down to about 800 HV in some cases. It appears from this comparison that our hardening materials have too low and uneven properties and they should therefore be replaced by better grades. (In this case the FNW has already turned to the "Baildon" Foundry). The plating technique itself also affects the quality of the hardening layer. We continue to use torch plating (in an acetylene-oxygen flame), whereas abroad high-frequency currents are being used for this purpose, which to a great extent eliminates negative results that can be caused by the carelessness or inability of the plater when he is unfamiliar with the parameters of torch plating. It will therefore be greatly desirable to switch to plating with high-frequency currents in the near future. However, until this occurs we must, as rapidly as possible, use better hardening materials than in past and sharpen to a maximum the technical discipline of plating. Without a decisive improvement in this section we will not obtain the full effects which we expect from the technical and structural changes introduced into the new method of manufacturing drill bits.

The trial batches of 216-millimeter diameter drills of all types made by the FNW according to the above specifications are tested in oil drilling and compared with drills made by the American Security Company. The results of these tests will decide whether the described construction and techniques can be utilized now in mass production or whether it will still require certain improvements. In any event, we are on the threshold of matching, qualitatively, the leading foreign products in drill production. The FNW will start to improve the construction and technical methods of drill manufacturing in a similar manner for other sizes--those used domestically as well as those that are atypical for us but are sought abroad, privided the new manufacturing method for 216-millimeter diameter drills gives good results.

Footnote

[1]As we mentioned at the beginning, we produce domestically principally four types of drills for each diamter, namely:
Type T- For hard formations, of a pressure resistance of over 1,800 kilograms per square centimeter to 3,000 kilograms per square centimeter.
Type S- For formations of average hardness of a resistance of over 1,000 kilograms per square centimeter to 1,800 kilograms per square centimeter.
Type M- For soft formations of a resistance of 400 to 1,000 kilograms per square centimeter.
Type BM- For very soft formations of a resistance below 400 kilograms per square centimeter.

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POLAND

Plans to Raise the Technical (Electrical Service and Equipment) Level of Railroads

[This is a translation of an unsigned article in Przeglad Kolejowy-Elektrotechniczny, Vol XII, No 1, January 1960, Warsaw, pages 1-4; CSO: 3734-N]

"Stronger emphasis must be placed on the introduction of new techniques into the railroads. Together with the electrification program and the introduction of Diesel engines, the application of automatic blocking systems, dispatcher remote control transmitting systems, relay-operated equipment, and automatic train-stop systems should be developed..." (From a resolution adopted at the Third Meetin of the PZPR regarding the guiding principles for the development of the Polish People's Republic during 1959-1965).

The continuously growing transportation problems force the transportation workers to look for ways which would permit them to carry out the railroad transport taks entrusted to them by the Party and government.

It is certain that one of the basic ways to increase the efficinecy of transportation is--besides adequate utilization of the already existing facilities--to raise the technical level through the modernization of this equipment and the construction of new facilities of the most advanced technical order.

The problems of the modernization of the railroads and the introduction of more advanced equipment were analyzed and discussed in detail at all PKP(Polish State Railroads) levels. These considerations resulted in the development of long-range plans. The third meeting of the PZPR emphasized the importance and necessity of introducing new techniques into the railroads.

The phase of discussion and planning has been partly completed. We enter a year of realization of our development plans. We are at the turning point of 1959-1960--the period during which we are to prepare the plan for the next five-year period, 1961-1965. This plan may be called the plan of the great development of new techniques on the PKP.

The advance of the individual branches of railroad engineering, presented in Przeglad Kolejowy-Elekrotechniczny [Electrotechnical Railroad Review], is characterized by the following trends.

1. In the Field of Railroad Traffic Safety Equipment

a) Modernization of railroad signaling systems, which consists of mass replacement of the presently used "shape signals" with perfectly visible light signals.

b) Introduction of automatic line blocking systems, which would provide higher traffic safety on the route and increase the density of traffic on railroad lines.

c) Replacement of traffic personnel employed in the operation of traffic safety systems on many stations of a given railroad section by a section dispatcher in charge of the dispatcher-control equipment.

d) Replacement of inefficient manual devices or obsolete mechanical control equipment by modern relay systems, very efficient and reliable in operation.

e) Protection of crossings at track level by means of adequate devices permitting, to the widest possible extent, the elimination of railroad traffic accidents, which unfortunately still occur.

f) Equipping of lines and stations of smaller traffic density with electro-mechanical equipment, which, although less efficient thatn the modern relay systems, entirely meets the demands of average traffic density.

2. In the Field of Railroad Communication Systems

a) Replacement of the existing long-distance aerial communication lines with underground cables, especially on main routes and electrified railway lines.

b) Increase in the number of long-distance communication lines through the application of multi-channel carrier telephony systems.

c) Further expansion of existing and construction of new central offices.

d) Equipppping the traffic communication with modern devices permitting efficient and reliable dispatcher communication (selectors), central office communication (automatic dispatcher switchboards), switching (radio-telephones, megaphones), etc.

3. In the Field of Power Supply

a) Meeting the consistently growing demands for electrical power at PKP railroad stations.

b) Electrification of railroad stations and stops, for which for various reasons it has not been possible to provide electric light installations.

c) Modernization of lighting equipment in accordance with the latest achievements in that field.

4. In the Field of Electric Traction

a) Electrification of more than 1,000 kilometers of double-track railroad lines, including modernization of tracks and stations.

b) Introduction of remote control for traction substations on the Warsaw-Gliwice line; introduction of local control for section switches.

c) Complete mastery of the production and industrial installation of domestic traction substations and remote control systems.

d) Development of the domestic production of type BoBo universal electric locomotives and electrical units adapted to low platforms.

e) Testing of experimental electrical traction sections of industrial frequency.

Railroad Traffic Safety

During 1959 and 1960 the basis will be laid for carrying out the great modernization plan in the field of railroad traffic safety systems during the next five-year period. In these years, the first investment tasks connected with the modernization of the above systems and equipment will be completed.

At present, work is being carried out on all electrified lines with the aim of replacing the existing arm signals with light ones. In 1959 the replacement of all arm signals with light ones on the Warsaw-Gliwice main route and the Lodz branch was basically completed. Some work was done on the Krakow-Szczakowa line. The work on other lines is in full swing. In general, it may be asserted that the replacement of arm signals with light ones will take place simultaneously with the putting of the respective electric traction sections into operation, or, in view of difficult construction conditions, one year after that at the latest.

The construction of the automatic line-blocking system on the Warsaw-Gliwice line is also in full swing. Intensive work is being conducted on two sections of that line--i.e., Warsaw-Koluszki and Piotrkow-Czestochowa. These sections will be completed and put into operation this year. The remaining sections of the line will be completed in the following years and will be provided with a more advanced system--that is, a code type blocking system, which will make it possible to equip this railroad line with continuous type automatic train-stop devices.

Dispatcher transmitting equipment is being installed on the Otwock-Pilawa line. Attempts are being made to put that equipment into operation for the summer 1960 railroad schedule. Furthermore, work has begun with the installation of dispatcher transmitting equipment in the Gdansk District Administration of State Railroads area (Pruszcz-Wisla Most). Parts of this project will be put into operation as they are completed; the entire project is expected to be completed by 1961.

Relay transmitting systems were installed in 1959 on several stations: Pruszkow, Plycwia, Rokiciny, and others. Two large stations (Szczakowa and Czestochowa Tow.) And several minor ones (Wolomin and Oliwa) are presently being provided with such equipment. The projects on these stations are advanced.

The plan for 1960 calls for the completion of the started relay transmitting projects and preparations for further installations to be completed in 1961-1962 through the construction of transmitting facilities on several other stations.

Simultaneously with the installation of hitherto applied systems, more work is being done on modernizing them. An album of Soviet relay wiring diagrams for a semi-block system was adapted for our needs and conditions; this system is expected to be tested on one of the stations in the Warsaw region. The problem of importing block system equipment from abroad is under consideration: this equipment will lend itself for adaptation to our operating and production conditions. Furthermore, a remotely controlled system for station transmitting equipment is in development; the latter will result in considerable savings on cables.

The problem of guarding crossings at track level was much discussed in 1959 as well as in the past years. It was recognized that the work connected with this problem should be mainly directed toward the preparation of documentation and the development of prototypes of automatic light signaling systems at crossings (without or with barrier). The documentation and a prototype of such a system have already been prepared.

The 1960 plan calls for a large number of such installations. Regardless of the above plan, normal type barriers but with light-duty rods were built in 1959 and are expected to be built also in 1960.

In 1959 and 1960, in addition to the advanced systems already mentioned, the construction of semi-automatic line-blocking systems will continue. To the major projects in this field belong the Wroclaw junction, the Wroclaw-Rawicz section, a number of sections of the Krakow-Przemysl line, and others.

In the field of mechanical transmitting equipment, work on several major stations (Piotrkow, Pilawa, and Siedlce) was basically completed last year. No major projects of this kind are expected to be undertaken in 1960. Only work connected with the rearrangement of existing facilities in this field will be undertaken.

In general, it should be asserted that 1959 was a very difficult period with respect to the installation of advanced railroad traffic safety equipment. The work carried out shows a drop of several percent; 45 percent of the annual plan was fulfilled during the first half of the year, which was considered consistent with proper progress of realization. The breakdown occurred in the third quarter, during which the plan was carried out only 73 percent.

The great range of projects, especially modernization jobs, must be included in the tasks of this year.

The above 1959 investment plan was not completely carried out, primarily for the following reasons:

1) General failure to carry out the planned work by the individual PRK and road crews in the construction and adaptation of control buildings; nearly all these buildings were completed three months, six months, or more behind schedule. On many stations the ready railway traffic safety equipment is waiting for the completion of sometimes minor construction jobs.

2) Delayed deliveries of cables by the industry. The delivery of cables has not proceeded according to the plan; the delivery of certain size cables was delayed to such an extent that in many cases it interfered with the advance of the work.

3) Lack of adequate coordination and control of the work on the part of the District Administration of State Railroads; to the basic errors belong:

[a] inadequate coordination of certain tasks on the part of the investor--for example installed equipment frequently waits for power supply;
[b] introduction of changes in the preparation of documentation (existing projects which in the course of last year were repeatedly subjected to changes);
[c] lack of interest on the part of various services of the District Administration of State Railroads, especially with respect to jobs carried out in an economic manner (adaptation of control stations, insulated sections, etc.).

4) Adequately carried out work by the contractors does not always ensure proper running of trains. And what are the prospects for carrying out the 1960 investment plan?

Many problems have been solved, namely:

[1] The investments have been prepared in a better way, and all the projects included in the 1960 investment plan are based on fully approved technical documentation.

[2] The overwhelming majority of projects are made up of jobs to be continued from before; therefore, the work of the railroad traffic safety equipment contractors is secured from the very first days of the year.

[3] In view of the program to i prove the concentration of outlays the amount of cables allotted will be utilized more efficiently.

In spite of notable improvements on many sections where railroad traffic safety equipment is being installed, the necessity of ensuring completion of control stations on time and of avoiding any changes in documentation still exists; these changes must not be as frequent or as basic as has been the case in the past. Moreover, it is necessary that in the field of railroad traffic safety installations the railroad operating services be fully included in the investment projects. The managements of the railroad traffic safety divisions in particular should take more interest in the projects carried out on their respective territories. It is also necessary to raise the potential of railroad traffic safety installations.

Railroad Communication

A basic and decisinve problem in the field of railroad communication is the construction of long-distance cable lines, which constitute about 40 percent of the total value of telecommunication projects.

The construction of long-distance cables in 1959 and 1960 is closely connected with the electrification of railroad lines. The existing aerial telecommunication routes on those lines must be replaced by underground cables, in view of their too close approach to the electric traction network. The purpose of the above is to eliminate any interferences in the operation of communication equipment. Nearly the total allotment, however insufficient, of long-distance cables is designated for railroad electrification purposes.

Because of the present difficulties in the production of long-distance cables, the communication branch is not receiving sufficient supplies to fully meet its demands. However, even these limited allotments are not fully utilized by the enterprises subordinate to the Ministry of Heavy Industry. Hardly 60 percent of the allotments were utilized in 1959. In 1960, 140 kilometers of long-distance cable are expected to be installed. The most urgent project is considered to be the installation of a cable on the Gliwice-Opole section, which determines the putting into operation of the electric traction line between Katowice and Wroclaw.

In order to increase the capacity of existing communication facilities, in 1959 eight-channel carrier telephony systems were installed. Furthermore, certain cables were deprived of their loading coils in order to adapt them for carrie-telephony. Domestically produced twelve-channel carrier telephony equipment will be made available for installation in 1960.

The construction and expansion of the KATS [not identified] proceed according to plans. Several large automatic central offices are under construction. The KATS in Skarzysko, Radom, Bytom, and Legnica were completed and put into operation in 1959. The KATS in Tarnow, Zurawica, Szczakowa, Tychy, and Wroclaw will be put into operation in 1960. Furthermore, selector type equipment, as a supplement to the section dispatcher network presently in operation, is being installed. These facilities extend to all the major cable lines. The station communication systems are supplemented, at an ever growing rate, with such important features as radio communication, which is used for distribution purposes. In 1960 this kind of facility will be installed in major railroad junctions, such as Tarnowskie Gory and Szczakowa.

Railroad Power Engineering

The problems of railroad electrification is closely connected with the problems of domestic power engineering. The increasing power demands, and therefore the construction of new substations, supply lines, etc., are very frequently linked with the general modernization of railroad lines, which in most cases is carried out in parallel with the electrification. Further more, various tasks resulting from general operational needs or the reconstruction and expansion of railroad facilities are also being carried out. These general tasks could be divided as follows:

[1] Tasks which do not make up part of the electrification program but which are nevertheless carried out on the electrified lines in connection with the modernization work.

[2] Power supply to traffic safety and communication equipment.

[3] Power equipment required for expanding railroad junctions and stations.

[4] Minor tasks resulting from general operational needs.

In 1959, the power engineering tasks were generally carried out, but in such a manner that the department felt a substantial lack of potential on the part of the engaged contractors and a shortage of cables owing to limited allotments and delayed deliveries.

Electric Traction

In 1959, 177 kilometers of newly electrified lines were put into operation: Zabkowice-Szczakowa, Krakow-Plaszow, Myolniki-Nowa Huta, Mydlniki-Prokocim, Blonie-Sochaczew, and Pruszkow-Grodzisk. Seven new traction substations of domestic production, excluding the rectified sets, were put into operation. The electric locomotive plant in Prokocim was handed over for use.

These investments made possible a direct connection of the Warsaw-Krakow route by an electric traction line. By taking over the freight traffic on the Szczakowa-Krakow section it became possible to liquidate the double traction which has been used to accommodate the heavy traffic on that section.

In 1960, 244 kilometers of additional electrified lines are expected to be put into operation, including the Gliwice-Wroclaw line. This will open the great electrified Warsaw-Katonice-Wroclaw main route, 470 kilometers long, as well as the Krakow-Wroclaw route, 243 kilometers long. The electrification of the Katowice-Murcki-Tychy line will make it possible to improve suburban transportation means to our new socialist city.

The 1960 plan sets difficult tasks before not only contractors but also the exploiters. Mastering electric traction in the Wroclaw District Administration of State Railroads, introduced there for the first time, will not be an easy task. However, carrying out these plans will require a great effort not only on the part of the Railroad Electrification Works Enterprise--which installs all substation facilities, the traction networks, and the high-tension lines, but as well of other enterprises which are engaged in the modernization of stations and tracks, railroad traffic safety systems, all types of crossings, etc. Therefore, these projects will require a special concentration and coordination of efforts in order to complete them according to schedule. This is especially important in view of the fact that our industry is engaged in the preparation of necessary electrical rolling stock, which, in case of delays in the electrification work, it will not be possible to put into service in order to relieve other locomotives needed to meet the growing transportation demands on other lines.

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Production of the Nowa Huta Cement Plant

[This is a translation of an article by S. Pieczara in Cement, Wapno, Gips, Vol XV/XXIV, No 10, October 1959, Warsaw, pages 270-271; CSO: 3739-N/a]

The expansion of the cement industry, conducted with great drive, realizes two goals set by our economic leaders. One is to assure the country a sufficient quantity of cement, and the other is to considerably lower the costs of production.

The realization of these goals includes the construction of factories of large production capacity, on the order of 800,000 to one million tons of cement per year, as well as the utilization of cheap raw materials such as granualr slag and small-grain limestone chippings.

One of the units, which should considerably increase our cement producing potential and at the same time supply cement at a lower production cost, is the "Nowa Huta" Cement Plant, which--as its name indicates--is located in the neighborhood of the "Lenin" Foundry in Krakow.

The cement plant will be supplied with blast furnace granular slag by the foundry and will use it as a semifinished product in the manufacture of Portland cement.

Preliminary work and preparation of the terrain for the construction of the cement plant was started in the beginning of 1956. Auxiliary and service units, as well as roads, railroad tracks, warehouses, shops, garages, high-tension lines and the like were constructed during the first phase of the work. At the same time the design plans of the production units were coming in. The construction of cement grinders, slag dryers, silos, and mechanized packing and slag mixing equipment, as well as storage facilities for clinker, slag, and gypsum were started in 1957.

The joint efforts of the crews of the investor and the machine and equipment suppliers, as well as the government planning offices, contractors, and subcontractors--despite mounting difficulties--made possible the conclusion of the first phase of construction four days ahead of the established time, and the cement production therefore started a month earlier--that is, on 1 June 1959.

The first batch of cement produced in the "Nowa Huta" cement plant was donated by the crew to the regional people's council--a contribution from Nowa Huta to the one-thousand-year school-building drive.

The last days before the construction was finished were not easy ones. The acceptance committees of particular units discovered small shortcomings; especially the experts called in by the investor checked in detail the recommendations pertaining to the health and work safety rules and insisted that they be carried out.

It was established during the assembly trials and during the start of the production ensembles that all rules pertaining to the health and work safety were observed. It must be stated unequivocally that the contractors removed all shortcomings quite rapidly.

Thus today the entire plant has been in full production for five months. It will now manufacture one-seventh of the country's annual cement production.

The investments in the "Nowa Huta" Cement Plant are not finished yet. An expansion is planned of an entire furnace section, raw material mills, and auxiliary installations.

After the expansion is completed--in 1962--the "Nowa Huta" Cement Plant will become one of the largest in Poland, producing over a million tons of cement per year.

It must be pointed out that the machines and production installations of the expanded sections will come from imports (West Germany) as well as from domestic deliveries.

The basic units already installed--that is the mills--are modern installations. They are equipped with electro-filters that catch the cement dust; this creates great savings as well as good health conditions for the plant and its vicinity.

A few words must also be said about the expansion plan of the furnace section. The cement will be produced by the dry firing method. The furnace output will be high and the heat consumption very low, since it will reach about 850 to 900 kilocalories per kilogram of clinker.

The "Nowa Huta" Cement Plant will be a highly mechanized plant and therefore one that will be very economical in operation. In order to provide the best conditions for the development of technical progress and the training of new crews, an experimental shop will be created at the cement plant, which, under the direction of the Institute of Construction Material Binders and with the support of the Technological Faculty for Binding Materials at the Mining and Metallurgical Adademy, will undoubtedly become one of the leaders in the cement industry, not only domestically but abroad as well.

In order to utilize fully and properly maintain the installed modern equipment, we must assure ourselves of a raw material basis and the proper crew.

As was mentioned above, the cement plant uses for the production of blast furnace cement granular slags from blast furnaces. The quantity delivered by the foundry is sufficent for the planned production; unfortunately, its quality does not entirely correspond to the requirements. We do not intend to explain what the quality of slag for the production of blast furnace cement should be, since much has already been written on this subject. Unfortunately, the metallurgical industry does still not show adequate interest in improving the quality of the slag, although each added ton of slag means an additional ton of cement.

The second of the above-mentioned conditions that would assure the proper functioning of the plant is a properly qualified and full crew. In the past the cement plant has encountered great difficulties in assembling its crew, and in the future these difficulties might be even greater if we do not take the required steps now. The situation is unfavorable because the "Lenin" Foundry and the construction enterprises connected with it employ a great number of workers and are able to pay them better than the cement industry. It is hard to imagine any worker with some qualifications accepting a job in a cement plant where the pay is considerably lower. This probelm requires a positive solution that will stabilize the crew. The migration of workers from other areas requires that they be provided with adequate living quarters. With this purpose in mind, the cement plant made efforts to obtain funds for housing construction and has made contracts with the Administration Worker Settlement Construction (Dyrekcja Budowy Osiedli Robotniczych) for the construction of apartment buildings. They will be delivered for use successively until 1962.

We believe, however, that all difficulties will be successfully overcome and, like the "Lenin" Foundry, we will celebrate our fete in ten years, summarizing undoubtedly commendable achievements.

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Economic Problems in the Development of the Cement and Lime Industry

[This is a translation of an article by Jerzy Bolkcwski in Cement, Wapno, Gips, Vol XV/XXIV, No 11 November 1959, Warsaw, pages 311-313; CSO: 3740-N/a]

The rapid development of construction in the last few years, as well as the expected rate of investment for the coming years, creates the necessity of selecting the most effective means of utilizing construction materials. Economic analysis supported by calculations have not been inadequately used; use was made of general coefficients, such as the production of a given material per inhabitant, its consumption compared to it consumption abroad, and the like. Although preliminary designs contained economic justifications of the investment purpose, nevertheless criteria such as covering the domestic and export needs, the amortization time of the plant, the cost of investment and exploitation as compared to already existing plants were used. Without minimizing the value of this kind of analysis, we must nevertheless recognize that such investigations are insufficient and should not decide the trend of investments to be made.

Effectiveness investigations may be made in various directions. They may describe the optimal size of the plant and the most suitable techniques; however, the most important direction is infinding a more economical material in the very cases where various materials can be mutally substituted.

In some branches of the industry--for example, in wall materials--the substitution of particular products may be realized to a great extent. We have at our disposal, alongside the traditional ceramic and lime and sand bricks, both hollow and solid, a group of prefabricates with cement as the adhesive--porous concretes, gypsum blocks, stone blocks, and the like.

In the case of binding materials, the substitution is considerably more limited. In practive, only cement can be used for all kinds of concrete work, on the other hand, the common use of cement, lime, and gypsum is relegated to plastering and binding slurries.

In order to present clearly the problem of the further production development of these binding materials, it is undoubtedly necessary to assure the full supply quantity of cement and lime for purposes which require the exclusive use of these materials; on the other hand, the analytical investigations which will describe the future developmental trends of the binding materials industry should be confined to the bulk of the problems where the mutual substitution of these materials in pertinent.

In the work on the long-range plan views were lately advanced that the proposed development rate of the lime industry was too rapid and should be reduced in favor of the cement industry. Without denying the necessity of assuring a full supply of lime for industrial purposes, it is felt that the proposed rise in lime production for building purposes during 1960-1965, amounting to 30 percent, should be limited to 15 percent.

Moreover, as an argument in favor of this idea cement consumption coefficients are cited, in relation to lime for building purposes in such highly developed countries as the U S A, West Germany, and Switzerland. A comparison of Poland with the U S A and West Germany should not be considered at all because of the completely different nature of construction and because of the considerably higher level of industrialization of construction. Switzerland too has a markedly different construction work arrangement because of the tremendous utilization of cement in work connected with road construction, mountain stream regulation, and the construction of mighty water dams.

We mentioned previously that in specific construction jobs cement must be used exclusively and for these purposes the needed quantities must be assured; similarly, some jobs require the use of lime. For example, it is hard to i agine inside plastering done with a purely cement or gypsum slurry. Moreover, we must remember that in traditional rural construction lime is willingly used and it is difficult to expect the peasants to abandon the mass use of this binding material in the next few years. It must be stated parenthetically that low level urban and rural construction does not involve high requirements with respect to hardness, and the use of cement in this kind of construction would simply be wasteful.

Another important problem is the location of the cemtn and lime production. Lime production is dispersed over the areas of the majority of wojewodztwos, and in many cases lime is a local material not requiring any deliveries from the supplier. Thsi fact must be considered in an economic calculation, since because of the actual location of the cement industry in Poland, cement requires transportation over considerable distances.

The most objective criterion for comparing the two materilas, cement and lime, is a calculation carried out on the basis of a commonly known formula of economic effectiveness:

$$E = \frac{I}{n} + (I\ 2\ I_p\ q + K + R$$

where: I = the direct investment expenditure per production unit on an annual basis.
I_p = the indirect investment expenditures.
q = the investment profit coefficient (it was assumed for plants that produce construction materials to be 0.07).
K = production cost per unit after subtraction of amortization.
R = costs of major repairs.

In order to determine the particular values for the cement industry, we based our calculations on the experience of the new plants either already erected or still under construction; on the other hand, the unit calculations are based on balance data for 250 Portland cement of 1957, with some corrections arising from the change in prices of coal and electric power. The amortization period was assumed to be 30 years, and 3 percent per year of the investment expenditure units was allowed for major repairs.

In order to determine the unit investment cost for construction lime, we made use of calculations for three types of plants that base their production on modern kilns--Saeger kilns. These materials were taken from a general speech on the subject of lime industry development in the long-range plan. The calculations were corrected in order to eliminate the expenditures for the production of li e used for other purposes (hydrated lime, fertilizer lime, fertilizer mare). The calculations for a plant with a production capacity of 180,000 tons of lime, corrected in the power and fuel columns, was taken as data from the cost fields. The amortization period and major repair costs were assumed according to principles similar to the ones used for the cement industry.

The cost of indirect investment was calculated in relation to the amount of coal used as fuel and converted to electric power to make one kilogram of cement or lime. In calculating the indirect investment cost, we considered the value of one kilogram of coal equal to 60 groszy [100 groszy in one zloty], and for the production of one kilowatt hour of power we assumed the consumption of 0.5 kilograms of coal.

Table 1

	I Zlotys Per Ton	K Zlotys Per Ton	R Zlotys Per Ton	n Years	Consumption of Fuel Kilogram Per Ton	Consumption of Power Kilowatt Hours Per Ton
250 Cement	1,000.0	215.64	30.00	30	293	95
Lime	340.0	202.05	10.20	30	240	36

The above table shows the data needed for calculating the investment effectiveness coefficient for cement and lime. The indirect investments for cement is as follows:

I_p = (293 kilograms of coal + 95 kilowatt hours x 0.5 kilograms of coal per kilowatt hour) x 0.6 zlotys per kilograms of coal = 204 zlotys per ton of cement.

Similarly the I_p for lime amounts to:

I_p = (240 kilogram of coal + 36 kilowatt hours x 0.5 kilograms of coal per kilowatt hour) x 0.6 zlotys per kilogram of coal = 155 zlotys per ton of lime.

The coefficient of the economic effectiveness of the investment is:

$$E \text{ of cement} = \frac{1{,}000}{30} + (1{,}000 + 204) \times 0.07 + 215.6 + 30 = 363 \text{ zlotys per ton}$$

$$E \text{ of lime} = \frac{340}{30} + (340 + 155) \times 0.07 + 202 + 10.2 = 258 \text{ zlotys per ton}$$

It is clear that the above calculations can contain certain inexactitiudes as a result of the starting assumption. Thus, for example, similar calculations carried out by a commission of the Ministry for the Construction and Construction Materials Industry describes E of cement as 385 zlotys per ton and E of lime as 299 zlotys per ton. As may be seen, the difference in the two calculations is small for cement; however, it is somewhat larger for lime. This seems to be due to the commission's assumption of excessively high unit investment expenditure values for this material. However, the basic case remains the ratio of the effectiveness coefficients of cement to lime, which is 1.3 or 1.4 and indicates in both cases the greater economic effectiveness of lime.

Independently of these comparison s of the economic effectiveness of these two materials, it is also necessary to consider their consumption in slurries of similar use.

"This Basic Consumption Standards of Construction Materials" foresee that for the preparation of a slurry designated for wall construction, lime slurries, in a ratio of one part lime to three parts sand are used. In this manner we obtain from one tone of fired lime 2.22 to 2.95 cubic meters of lime dough. One cubic meter of lime dough gives approximately three cubic meters of slurry. Thus we obtain from a ton of fired lime 7.3 cubic meters of slurry; this means that one cubic meter of slurry requires the consumption of about 140 kilograms of lime. This value is confirmed by the "construction tables" of Karol Turnowski (page 39, Table 14), which give 135 kilograms of fired lime in a one-to-three slurry. Furhter confirmations of this calculation can be found in the "Catalogue of rounded off cost calculation standards" (Part II, page 174, paragraph 4), where the consumption of lime is given as 163 kilograms, however, we must remember that this "Catalog" serves for making cost calculations and therefore considers losses arising at the construction sites.

A cement slurry in the ratio of one part cement to six parts sand is used in construction for erecting walls. According to "The Basic Consumption Standards of Construction Materials," 200 kilograms of grade 150 cement--and, according to Tarnowski, even 225 kilograms--must be utilized to produce one cubic foot of such a slurry. Considering that the relatively high hardness of such a slurry is not necessary from the point of view of construction needs, slurries of one-to-eight could be used, which would require, according to the mentioned construction tables, 180 kilograms of cement slurries of even one to ten could be used which would require 150 kilograms of cement (page 39, Table 15).

As appears from the above, the production on the construction site of a cubic meter of slurry of comparable usefulness requries the consumption of a smaller amount of lime than cement--from 7 to 15 percent less.

These considerations clearly indicate that lime has more profitable effectiveness coefficients than cement, and, moreover, it is consumed to a lesser degree for the same purposes as cement, thus in all cases where the mutual substitution of these materials can be considered, all logic points to the use of lime.

It seems wrong under these conditions to undermine the development rate of the lime industry in favor of an in increased rate of cement production development.

In order to describe the correct development proportions of the binding materials industry, we must first of all establish the construction needs in the field of cement in all places where its replacement with lime is impossible, and then do the same with respect to lime. Only for the part of the needs where mutual substitution is possible, from a technical point of view, should we consider the above presented economic arguments.

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Labor Productivity in the Cement Industry

[This is a translation of an article by R. Markiewicz, in Cement, Wapno, Gips, Vol XV/XXIV, No 12, December 1959, Warsaw, pages 343-347; CSO: 3741-N/a]

As is well known, the cement production process requires the use of a considerable number of large power-consuming machines and intallations.

On the other hadn, the participation of human labor in this process is limited principally to servicing and attending the machines and can freely be regulated by the degree of production mechanization.

The cement industry, which has an age-long tradition of Polish soil, was always technically progressive industry, and despite the very large capital outlays required, the industry always showed tendencies toward modernization of techniques and technological processes.

The driving force of the technical progress during the period of capitalist economy was, as in the majority of industires, the competitive fight and the fear of being outdistanced by rival industrial organizations on the domestic as well as the international market. Nevertheless, disregarding this premise, we may state that the Polish cement industry, from the technical point of view, occupied a generally favorable spot among the countries producing cement on a large scale.

Polish cement, thanks to its excellent technical crew, always enjoyed a good name on foreign markets.

The technical state of the cement factories suffered considerable damage as a result of wasteful exploitation during the war and destruction caused by war activities.

As a result, in the first postwar years when numerous European countries--even those that participated in the war but suffered a lesser degree of destruction--could start to modernize their industry, in Poland we had to struggle to re-establish even the previous technical state of our cement plants.

The period of reconstruction and production organization based on the existing installations included the years 1945 to 1949. In 1949 we considerably exceeded the cement production achieved in the prosperous prewar year of 1938.

The actual period of expansion, modernization, and mechanization of cement production in Poland started in 1950--that is, when we began to realize the Six-Year Plan. This plan envisioned the construction of new factories which were supposed to produce 4,800,000 tons of cement in 1955.

The commonly known difficulties that appear in construction and that are based primarily on faulty organization in the supplying of construction sites, an inadequate staffing of construction crews, lack of trained personnel, and so on limited the scope of the planned development, extending it in time.

Nevertheless, during 1950 to 1958 the following were installed, in chronological order:

1) a rotary oven in the "Wejherowo" Cement Plant
2) a rotary oven in the "Groszowice" Cement Plant
3) the "Odra" Cement Plant in Opol
4) a quick setting cement division in the "Groszowice" Cement Plant
5) the "Wierzbica" Cement Plant
6) the "Rejowiec" Cement Plant
7) the "Warszawa" Cement Grinding Station
8) the "WiekII" Clinker Plant
9) the "Nowa Huta" Cement Grinding Station.

The "Chelm" Cement Plant and two additional rotary ovens in the "Wierzbica" Cement Plant are in the final construction stage. A full modernization of the "Podgrodzie" Cement Plant was also carried out.

All the above production units, perhaps with the exception of the "Podgrodzie" Cement Plant, were based on the then most modern technical achievements and equipped with installations of excellent technical coefficients.

Independently of the above investment enterprises "par excellence," in the past few years, there was carried out, at a cost of many hundreds of millions of zlotys, the mechanization of the labor consuming loading and unloading activities in almost all old cement plants.

The degree of mechanization on these jobs is now estimated to be about 90 to 95 percent of the total load handling capacity.

The production capacity of the new cement factories--constructed after the war and equipped with modern technical equipment--in relation to the capacity of the entire industry has already reached 50 percent.

Such a condition should be reflected ina progressive increase in the work output. These facts are actually confirmed (Table 1). The absolute rise in labor productivity amounted to 66.6 percent over the last ten years.

Table 1

Years	Productivity in Tons Per Year Per Employee in the Industry	Number of Man-Hours per Employee Working in Production Per Ton of Cement
1949	269.7	6.86
1950	273.1	6.56
1955	370.7	4.92
1956	381.7	4.77
1958	438.7	4.28
1959 plan	449.3	4.11

The listing below will allow us to evaluate the labor productivity of various plants, considering their size and modernity of techniques.

We have selected the following from among 14 currently active cement plants that carry out a full production cycle.

a) The "Bolko" and "Wejherowo" Cement Plants, which represent small old plants.

b) The "Goleszow," "Piast," and "Wysoka" Cement Plants, which represent large old plants.

c) The "Wierzbica," "Odra," and "Rejowiec" Cement Plants, which represent large new plants.

The productivity coefficients per employee in tons of cement per year (data from 1958) are as follows:

"Bolko"	295.8
"Wejherowo"	225.6
"Goleszow"	323.8
"Piast"	496.0
"Wysoka"	415.8
"Wierzbicz"	517.5
"Odra"	681.6
"Rejowiec"	593.9

These coefficients are somewhat deformed by the shifts of clinker among the cement plants which occur in our industry. However, these quantities are not very considerable and their effect in deforming the actual picture is not very great. On the basis of these coefficients, the trend toward building new and modern production units, realized now and planned for the future, is absolutely justifiable.

We obtain a vivid example of the effect of modern technical equipment on productivity by listing the labor consumption coefficients per production unit of two cement plants, an old one("Wysoka") and a modern one("Rejowiec"):

The number of man-hours put in by the workers of the industrial group, to produce one ton of cement is as follows:

Years	"Wysoka"	"Rejowiec"
1955	5.2	4.92
1956	5.3	3.62
1957	4.5	3.62
1958	5.0	3,37

An analysis of the cited productivity coefficients, for the entire industry as well as for particular groups of plants, shows that we obtain by the expenditure of many hundred of millions of zlotys for investments and production mechanization, a steadily reduced labor consumption per unit which is equivalent to a steadily reising labor productivity.

Two problems emerge from the above considerations:

a) the public effectiveness of the financial expenditures;
b) the correctness of the rate of growth of labor productivity in the postwar years.

Both of these most interesting although very difficult problesm extend considerably beyond the scope of these considerations. However, it seems, without deeper investifation, that the rate of growth of labor productivity in the last ten years is inadequate.

We return to the principla topic, which is the state of the cement industry and methods of increasing labor productivity. After establishing that the present technical state of the Polish cement factories does not deviate drastically from the technical level of other large producers and that the share of modern production units in the general pool of plants is very large, let us compare, in absolute numbers, our labor productivity with that obtained in a number of other countries:

Country (Data of 1955)	Coefficient, Tons per Worker Per Year
Switzerland	1,527
Belgium	1,294
England	1,129
Sweden	1,010
West Germany	988
France	988
Denmark	731
Italy	678
Poland (in 1955)	483
Poland (in 1958)	556

The divergence between the results obtained by us and by many foreign countries is drastic. The labor productivity now obtained in our industry reaches one third to one half of the productivity obtained in these countries.

Unfortunately, because economic and organizational problems of the industry are always omitted in international exchanges, we lack more concrete and analytical comparison materials which would make possible an honest appraisal of the organizational forms that affect the size of employment and labor productivity in the leading countries. The available materials originate from marginal and very fragmentary observations by persons traveling abroad in connection with other matters. The disregard in the past and the continuing failure to appreciate such important problems in the industry as scientific work organization, labor psychology, and investigation of modern forms are--among other objective reasons--the cause of the shamefully low labor productivity in our cement industry.

Even a cursory analysis of the employment structure in the cement industry shows a serious burdening of production with an unheard of number of workers employed in auxiliary divisions. This state is depicted by the coefficient that describes the percent ratio of shop and auxiliary division workers to the workers employed directly in production, over the entire industry; it amounted to 69.1 in 1958. This is a ratio probably not found in any other country.

The percent ratio of shop workers to the total number of employees in the industrial group is equally disturbing.

It amounted, in consecutive years to:

1955	22.88
1956	22.36
1957	22.56
1958	22.74
1959 planned	22.02

This most unfavorable ratio of workers in direct production to those in shops and auxiliary divisions is found in old as well as new cement plants.

For example, in 1958 the share shop workers to those directly employed in production amounted to:

Old Small Plants:	"Bolko"	90.0
	"Wejherowo"	82.6
Old Large Plants:	"Goleszow"	79.6
	"Piast"	49.5
	"Wysoka"	89.1
New Large Plants:	"Wierzbica"	53.0
	"Odra"	69.9

A view of the state of overstaffing in particular divisions of our industry can be gained from a comparison with the state of employment in one of the Italian factories--the "Bagnoli" Cement Plant near Naples. (The materials for the comparison were obtained by a delegation of Polish cement industry specialists under the leadership of Prof Dr Grzymka.)

This plant produces cement by the dry method in a quantity of about 430,000 tons of cement per year, in terms of pure Portland cement.

The plant most similar to this one in size and technology is our "Goleszow" Cement Plant. (In order to obtain closer comparability, we excluded from the employement in the "Goleszow" Cement Plant the crews of the stone quarries and the electric power plant.) The comparison is given in Table 2.

Table 2

	"Bangoli"	"Goleszow"
Production in thousands of tons of cement per year	430.0	280
General employment (place of work)	252	584
Processing of raw material	40	67
Ovens and transport of clinker	15	95
Cement grinding mills	11	33
Packing plant	26	29
Laboratory	7	22
Shops	32	179
Yard workers	23	47
Porters, cleaners, watchmen	14	24

Obviously, the differences in technology, size, and modernity of the plants prevent a full and direct comparison. Nevertheless, a listing of employees in many sections gives a picture of overstaffing in our plants. For example, at almost twice as high a production in the Italian cement plant, one third as many people work in its laboaratory than in ours. The clinker grinding mills in the "Bagnoli" Cement Plant actually grind a considerable largeer quantity of clinker than shown in the listing, since the plant produces blast furnace cement with a large qunatity of filler. Despite this, the crew of the mill consists of only eleven people, whereas in the "Goleszow" Cement Plant there are 33. A similar situation exists in the packing plant. However, the most glaring example of overstaffing is in our shops which employ almost six times as amny people as the shops of the "Bagnoli" Cement Plant. Our staff of yard workers is also twice as large.

The above illustrated state of affairs proves the existence of certain objective reasons for maintaining such a numerous staff of workers generally and so many auxiliary workers in particular.

It seems that three fundamental reasons are involved:

a) serious inadequacies of our system of supplying the industry with spare parts for the production installations;

b) an inadequate degree of direct interest on the part of management and crew in improving the work organization and eliminating the excesses in employment;

c) the quite common practice of transferring elderly workers from production divisions to auxiliary divisions in order to obtain for them the required number of years of service which would entitle them to a pension.

The continuous difficulties with deliveries and processing of spare parts have led to a condition in which the plant shops, which were created to take care of minor repairs and eventually to do periodic machine overhausl, are actually engaged in the production of spare parts and machining of castings, cog wheels, power shafts, and so on.

Numerous cases are known where standard screws were actually produced in the factory shops. Such a state of affairs is not found in any country which has an organized supply base --that is, where all kinds of spare parts can be pruchased ready-made, outside of the plant, in factories which specialize in this field.

A closer analysis of the ship personnel reveals, moreover, that in every plant there is a relatively small group of highly qualified people and a more numerous group of people with low qualifications, or apprentices whose services to the plant do not warrant the cost of keeping the. The plant shops have become, in many cases a haven for workers of limited productive capability, whether for reasons of health or age.

The problem of organizing the supply of spare parts and reinstating the proper functions of the plant shops becomes at the present moment one of the main factors that very seriously affects the cement production cost.

The habit, acquired over many years of practice, of carrying out the production plans at any cost even at the cost of excess employment in order to avoid the even more unpleasant consequences for the plant management if the qunatitative production plans are not fulfilled have caused a considerable number of factories to maintain a quite considerable number of people as a reserve against sudden outbreaks of absenteeism, be it for seasonal or health reasons, or as insurance against the breakdown of loading and transportation facilities.

The latter case is especially significant for the employment level.

Large fines for typing up railroad cars over the allowed time and difficulties that arise in the production process from a breakdown of the mechanized loading installations are the reasons for maintaining a larger than average crew of yard workers. The worsening of financial results due to a continued burdening of production by excessive employment is considered a lesser evil than the eventual immediate costs of a breakdown. Such an approach to the case is the result of a common disregard of the economic balance in the plant activities as well as the lack of direct incentives for improving the work organization.

A number of concepts aimed at improving relations in this field have unfortunately not been put into effect as yet. The simplest and most convincing conept seems to be to leave to the plant a part of the salary fund, saved through reducing the number of employees, and earmark it for raising the salaries in the production division that has improved its work.

Obviously, such a solution arries the danger of exaggerating the employment organization. However, it is possible to carry it out by assuming a proper level of enlightment and supervision by the labor unions, worker's councils, and management.

And finally, the third reason for excessive employment is the frequent cases of employing workers whose productivity is low because of their age, in order to make it possible for them to obtain pension rights.

The sum of these reasons has such a negative effect on our employment picture, that it also affects the labor productivity coefficients in our industry.

Excessive employment does not affect the auxiliary divisions only; it also appears in strictly production divisions--for example, in stone quarries, internal transportation, and so on.

The degree of mechanization in the stone quarries belonging to the cement plants is basically quite considerable, and therefore in many cases the employment level in these divisions is unjustifiable. A vivid and extreme example of this would be the "Wiek" Clinker Plant, which employs 133 people in a mechanized stone quarry. The plant laboratory staffs were also expanded to exaggerated dimensions. They sometimes employ numbers of people corresponding to those in scientific and research institutes.

Therefore, the low level of labor productivity coefficents is primarily the result of an improper and uneconomical employment structure.

The sporadically undertaken actions of revising the employment state had the anture of an adminstrative order and were not based on permanent incentives; thus they usually brought insignificant results.

A radical improvement in the situation in this field cannot be based on stop-gap meansures but must result from an enlightened self-interest and continuous public improvement of the work organization. In connection with this, the proposal to introduce a proper system of direct incentives that would affect the interest of management and crew in liquidating excessive employment becomes topic number two, after the problem of reorganizing the shop service and supplying the cement plants with spare parts.

One of the simplest solutions in this field would be to allot the cement industry a processing limit, according to its needs, in the production plans of the foundries and metallurgical plants under the Ministry of Heavy Industry. Moreover, the developing cement industry requires--and will need it even more in the coming years--close cooperation with the machine construction plants to ensure the delivery of complete production ensembles for particular divisions such as crushing, grinding, packing, and the like.

Basing the needed exchange parts for production facilities and plant modernization on the import of machines on the scale necessary in the coming years seems to be impossible and unjustifiable. The cement industry in Poland can and must have a specialized supply base in the machine and heavy industries commensurate with the role assigned to it in the general development of our economy. This is a "sine qua non" for further progress in this industry.

The productive capacity of the machine and metallurgical industries assures principally the realization of the presented proposal. The problem lies in working out the organizational form of cooperation most favorable for both sides and implementing them by proper standardization activities.

Next in the hierarchy of problems that affect the labor productivity level is the introduction of correspondingly strong incentives that would act continuously and interest the entire crew, from the staff of particular jobs up to the manager of the plant, in reducing employment through the introduction of better forms of work organization and technical progress.

The mechanization of loading and unloading should occupy an important place in the program of raising labor productivity. Unofrtunately, this problem is sometimes connected with considerable financial expenditures: we have in mind here mainly the installation of highly efficient, modern railroad car tipplers and overhead crane installations.

The case in the field of cement packing is of a similar kind; moreover, here the health factor becomes an additional problem.

Considerable savings in work and means could be achieved in this production sector through maximum development of bulk cement shipments.

Alongside the discussed factors of an organizational and technical nature that affect the labor productivity level, there appear numerous no less real elements which, although not directly connected with productivity, are decisively subjective. Among them the main one is the problem of professional training of management and average technical supervisors in cement factories. The proportion of qualified technical personnel in the industry is unsatisfactory. The case is even worse in the matter of the economic personnel whereas in the case of the technicians the problem is mainly one of quantity, in the case of staffing the economic positions we are dealing primarily with a highly unsatisfactory professional level and the consequent lack of inventiveness. Aserious obstacle in improving the organizational structure of production is the mutual misunderstanding between technicians and economists of their common goal, and sometimes simple ignorance of the effects of work organization upon productivity and production costs.

The slogan "economizing on technicians and technicizing the economists" actually has a real meaning.

It is hard to imagine an efficently working plant managed by technicians who disregard economic caluclations on projects taken up, or, vice versa, a good economist who would divorce himself in his work from the concrete conditions and technical capacities of his plant.

Even in the practice of the cement industry positive results are known which result from harmonious cooperation of the two. It seems that a basic part should be played by the universities that prepare young crews for industry in the matter of preparing and enlightening them about the close relationship of techniques and economy in plant practice. A broad training program among the workers already employed in particular production plants would be advisable.

As an example of how much significance is attached to a knowledge of economic problems, and primarily the scientific fundamentals of work organization, it is enough to mention that in the French higher institutes of technical learning 20 percent of the lectures during the first two years of study are devoted to these problems.

In summary, we may state that the Polish cement industry has in principle the conditions for improving labor productivity. However, it is imperative to take steps, rapidly and forecefully, toward a permanent improvement of the work organization and, basing it on scientific foundations, also to employ people with the proper technical and economic preparation in the management of plants, on a broader scale than in the past.

Summary

This article contains a critical evaluation of the actual state in the field of labor productivity and its trends in the last few years. As a comparison gauge, data was taken from a number of European countries.

In the course of the considerations the author established the main reasons for the low level of labor productivity in the domestic cement industry. He advances proposals, putting emphasis upon the necessity of conducting--on the basis of scientific principles--intensive research in the field of modern work organization, making organizational changes in the material and technical supplies, and introducing incentives which would continuously act toward increasing productivity.

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Reply to Article on Investments in the Cement Industry

[This is a translation of an article by F. Zabiak in Cement, Wapno, Gips, Vol XV/XXIV, No 12, December 1959, Warsaw, pages 347-349; CSO: 3741-N/b]

In the April issue of Cement, Wapno, Gips the editors published an article by Magister R. Markiewicz and Magister J. Wojt, entitled "Remarks on the Article 'Investment Trends in the Cement Industry.'" This was a discussion of my article by the same name, published in the same issue.

Disregarding the tenor and the form of discussion in the article of R. Markiewicz and J. Wojt, I would like to confine my attention to the "remarks" pertaining to the merits of my elaboration. These remarks can be divided into the following:

[a] The supposition that the article was based on working materials of the planning department of the Ministry of Construction and Construction Materials, at the same time giving the wrong coefficient for the share of high grade cements according to the plan for 1965, whose share in the tentatively approved plan is 36 percent for this year and not 50 percent.

[b] Failure on my part to give attention to the difficulties construction encounters because of the use of blast furnace cements during times when the ambient temperature drops to less than 5 degrees centigrade.

[c] The impossibility of increasing the amount of granular slag added to blast furnace cements to more than 40 percent because "industrial experiences do not confirm the theoretical assumptions of the author [that is, mine] and it would be risky at the present time to raise the addition of granular slag to blast furnace cements above about 40 percent". My adversaries justify the impossibility of increasing the slag addition above this limit by the unsatisfactory quality of the granular slag and the chemical composition of the clinker, of which not all can tolerate the increased addition of granular slag. Next, the authors state that "this pertains parti-

cularly to clinker of high silicate content, and the clinker from the "Wiek" Cement Plant, which actually comprises the basis for blast furnace cement, is such a one."

In connection with these remarks I must again speak up in order to let the readers know how things actually look.

The material pertaining to the assortment make-up of cement production for 1961-1965 was based on official documents that can be found in the Cement Industry Association (Zjednoczenie Przemyslu Cementowego) in the Department of Planning and Production of Contruction Materials at the Ministry of the Construction and Construction Materials Industry, as well as in the Planning Commission of the Council of Ministers and in the Supreme Control Chamber (Najwyzsza Izba Kontroli).

It appears from these documents that the tentatively approved plan for 1961-1965 estimated the share of high grade cements for 1965 at 50 percent. If the present assortment make-up of cement production has been changed, I would like to note that the materials on which I based my previous article contributed somewhat to this. Nevertheless, I still consider the assortment arrangement of the cement production, on the basis of the data in my previous article, as incorrect because, according to the data obtained from the Cement Industry Association in Sosnowiec on 8 October of this year, the arrangement will look as follows in 1965 (Talbe 1):

Table 1

Cement Assortment	Quantity in Thousands of Tons	Percent
Portland cements		
250	1,866	18.7
350	4,054	40.5
Quick setting	130	1.3
Blast furnace cements		
250	3,480	34.8
350	360	3.6
Others		
Sulfate cement	50	0.5
White cement	60	0.6
Total	10,000	100.0

One can have a different opinion about this matter, but it seems to me that making decisions which have highly significant economic results should be preceeded by an economic calculation. This same principle should be adhered to in the course of a discussion. Obviously, it is easier to make remarks from which it would appear that the argument is pointless than to bring evidence which would disprove concrete calculations.

Finally, I would like to inform the readers that the case concerning the remarks about the assortment arrangmenet is being examined by the proper authorities.

The case of the eventual difficulties for construction resulting from increasing the production of blast furnace cements, to which the authors of the article call attention, does not seem to have any decisive significance for the assortment arrangement. It must be admitted, however, that granular blast furnace slag that is added to clinker, despite its hygroscopic properties, hydrates more slowly than cement clinker. This is the cause of certain differences in the physical properties of Portland and blast furnace cement, such as setting time, hardening, heat emanation, and shrinking changes, as well as differences in chemical composition--mainly a lower content of CaO in blast furnace cement, which gives the blast furnace cement such properties as resistance to chemical attack and influences its total quantity of emanated heat.

Obviously, the differences in properties between the Portland and blast furnace cements will increase as the share of slag in the cement is increased.

All parameters of blast furnace cement having any greater significance for construction techniques--such as hardness, setting conditions, and constant volume--are identical with that of Portland cement.

Generally it can be said that blast furnace cement, in comparison with Portland cement of the same grade, is characterized by:

a) an extended beginning and termination of setting time amounting to two or three hours, but not exceeding the standards for Portland cement;
b) a lower heat of hydration, by about 25 percent, and a more uniform heat emanation in time, which decreases considerably the danger of internal thermal stresses and the appearance of cracks in large concrete bodies;
c) a definite higher resistance to chemical attack, particularly by sulfurs;
d) a somewhat lower rise in pressure resistance at the

onset of the setting period, which requires greater care of the cement during this period (watering);

e) greater hardness effects when the concrete is steam treated;

f) lower shrinkage.

According the the opinions of the Construction Technology Institute (Instytut Techniki Budowlanej) and the Organization and Construction Mechanization Institute (Instytut Organizacji I Mechanizacji Budownictwa), if a blast furnace cement meets the requirements described in standard PN/B-30005. There is no reason to treat such a cement as a poorer binding material than Portland cement of the same grade, with the provision that, for special conditions such as working with it during the winter or in cases where it is necessary to remove the boards rapidly, additional means or technical precautions have to be used. Means that would eliminate the undesirable characteristics of blast furnace cement in such cases and would permit its use on an equal footing with Portland cement could be the addition of about two percent of calcium chloride, based on cement, or warming of the concrete.

The effects of calcium chloride on the setting process of a blast furnace cement slurry aging under unfavorable temperature conditions was described by Magister Engineer Jadwiga Lewitas in the Science and Technology Information Bulletin, No 1-2/59 of the Construction Technology Institute (pages 58 and 59) (Biuletyn Informacji Naukowo Technicznej, Instytutu Techniki Budowlanej). It is obvious from the results given there that the addition of two percent of calcium chloride causes not only a rapid rise in hardness but the 28-day hardness of blocks made with this additive exceeded the hardness of blocks made without it.

Moreover, blast furnace cement is more useful than Portland cement for the following construction work:

[a] Structures of concrete and reinforced concrete units exposed to the attack of chemical factors and soil acids, such as foundations, surfaces, floors sea structures, water and farm structures, and the like.

[b] The construction of water immersed units, such as dams, weirs, bridge pillars, and the like.

Because of the justified practical possibilities and the frequent necessity of using blast furnace cement in constructopm amd a;sp cpmsoderomg tje ecpmp,oc effects which can be obtained through developing the production of this cement, we must admit that the production of this cement is advantageous from the economic point of view. Attention must be called here to the fact that the construction enterprises have no incentive to expand the scope of blast furnace cement utilization, because the price of Portland cement and blast furnace cement is the same, despite the fact that the production cost of the latter is considerably lower.

The thesis of the authors about the supposed risk of increasing the granular slag about 40 percent in the production of blast furnace ements does not stand up.

The suggestions advanced in my article, based on an evaluation of this problem by the best proffesionals in the country, have been confirmed by production results obtained in the second half of this year in the "Nowa Huta" Cement Plant.

This cement plant grinds clinker from the "Wiek" Cement Plant, which does a high silicate content, and at the same time it uses 50 to 60 percent of granular slag from the "Lenin" Foundry--a slag described as of low quality which no other cement plant wanted to accept. The results obtained by the "Nowa Huta" Cement Plant in July and August of this year are given in Table 2.

Table 2

Date	Resistance to Bending, in Kilograms per Square centimeter After Seven Days	Resistance to Bending, in Kilograms per Square centimeter After 28 Days	Resistance to Compression After Seven days	Resistance to Compression After 28 Days	Grinding 4,900 O/per Centimeter	Percent Slay Additive
8.7	48.5	71.8	185	343	6.8	50.0
9.7	45.2	66.7	178	317	6.2	50.3
15.7	48.3	70.3	216	384	5.3	50.0
16.7	42.1	62.1	176	293	7.8	50.0
18.7	39.0	60.0	153	311	4.2	51.3
24.7	34.9	57.5	139	262	3.6	50.0
13.8	46.4	66.6	188	373	3.8	47.0
23.8	45.4	-	203	-	4.0	50.0
27.8	30.6	65.5	111	284	4.3	60.0

The chemical analysis obtained during this time is given in Table 3.

Table 3

Composition	Cement	Clinker	Slag
Losses on Combustion	0.00 ÷ 1.11	0.35 ÷ 1.44	0.13 ÷ 0.55
SiO_2	28.60 ÷ 33.10	27.90 ÷ 32.30	38.50 ÷ 39.00
Fe_2O_3	1.46 ÷ 2.63	1.29 ÷ 1.99	0.30 ÷ 0.99
Al_2O_3	5.75 ÷ 7.84	6.06 ÷ 7.81	9.10 ÷ 10.70
CaO	53.80 ÷ 57.10	53.90 ÷ 58.30	42.20 ÷ 44.60
MgO	3.09 ÷ 3.98	3.07 ÷ 3.80	5.95 ÷ 6.77
SO_3	0.30 ÷ 0.99	0.63 ÷ 0.99	0.14 ÷ 0.84

Attempts to produce a cement with 70 percent blast furnace slag added and an Al_2O_3 content of 16 percent gave a cement with a hardness value of 284 kilograms. Obviously, we have to give credit here to the achievements of the management and technical personnel of the "Nowa Huta" Cement Plant and particularly to director Magister Cichon and his aid, Magister Pieczara, to whose knowledge and industry we owe the achievement of such positive results.

It was decided, in connection with these results, that the average addition of blast furnace slag in producing blast furnace cements will amount to 50 percent in 1965, with a tendency to raise it further.

The Interbranch Committee for the Management of Blast Furnace Slags, under the energetic leadership of Magister Engineer Sitkowski, which has prepared within a short time a draft of a government decree that contains a concrete program of action in this field, has also contributed greatly toward increasing the use of blast furnace slag in cement production. We may expect that my suggestions, as advanced in the previous article, will be realized.

The important task now seems to be assuring the stability of Portland clinker and adhering to conditions of technical discipline in granulating blast furnace slag.

In conclusion, it is worth mentioning that the slag addition to cement production, resulting from the statistical data which the authors quote, was actually higher. From the findings of the control bodies, it appears that some cement plants show in their reports a lower consumption of slag than they actually used, hiding in this way the fact that they did not complete the planned clinker production. The "Wysoka" Cement Plant did this; they showed in their report that in 1958 they added to 250 Portland cement 15.75 percent granular slag, whereas they actually added 19.35 percent--thus 13,530 tons more than reported.

I see no need to take a stand with respect to the remaining remarks in the article of Magisters Markiewicz and Wojt, since they are the result of either not understanding the exact content of my article--as for example, at the end of the article where I supposedly complain about the lack of an analysis for the needs of cement during the years covered by the long-range plan, where in reality I wrote extensively about such an analysis having beeen made at the end of my article (Cement-Wapno-Gips, No 4, page 87)--or from excessive demands that I treat the entire investment problem, such as location, optimal size of production, and the like. I did not discuss these last cases because of their difference from the general topic of my article.

These items, frequently in the forefront of the main development trend of the cement industry, about which I talked in my article, will surely be properly considered by the Professionals of the Cement Industry Association in preparing the long-range plan as a result of the decision of Prof Dr Grzymka to increase the addition of blast furnace slag in the production of blast furnace cement.

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The Role and Tasks of Agricultural Circles

[This is a translation of an article by Zdzislaw Jagielski and Jan Kilgert in Chlopska Droga, No 6, 20 January 1960 (supplement), Warsaw, pages 3-15; CSO: 3743-N]

Today, Agricultural Circles are a general subject of conversation, and not only in the rural areas. They are discussed by persons sincerely interested in the development of agriculture and by certain strong opponents of Agricultural Circles. The latter do not watch passively the gains this growing peasant organization make in strength and importance. They try as much as possible to undermine the farmers' confidence in Agricultural Circles. They dislike not only the very idea of Agricultural Circles but everything that is new and progressive, everything that means a step forward in the work of i proving the level of our agriculture, which is still very backward.

The Agricultural Circles bring progress, and progress is always connected with the new methods of work, new and better techniques of production. In a word, progress means changes--which always, before they are fully understood by everybody, give rise to some doubts.

Thus, it is worth while to clarify at a little more length the origin of the idea of Agricultural Circles as the main organizer of agricultural production and propagator of modern and more productive methods of farming.

As is generally known, Agricultural Circles existed even before the war. They were created first of all as a result of the peasant tendencies to organize and unify against exploitation. Naturally, in other social and economic conditions, the circles had a slightly different character than at present. The activities of the circles in those prewar times were influenced by capitalist elements. Nevertheless, it is a fact that the main motive for the organization of peasants in Agricultural Circles was defense against exploitation and a desire to overcome difficulties with which no farmer would be able to cope alone.

The present Agricultural Circles continue these good traditions. As is probably generally known, in the course of the last three years 20,000 Agricultural Circles were created in Poland, unifying over half a million peasants. This figure grows literally from day to day. Thus, it is really a mass movement. Its essential, most important characteristic is the fact that it was created and is developing on the initiative of the peasants themselves, that it is a result of the needs, and the most vital needs, of the rural areas.

To answer the question, who actually needs the Agricultural Circles, it suffices to consider the present achievement of that organization and that which is being done by the Agricultural CIrcles. It would be possible to answer most generally: the activities of the circles aim first of all at increasing agricultural production and at developing a wider social, economic, educational , and cultural initiative. It would be possibel to give many examples of fruitful activities of many Agricultural Circles. However, we are not concerned with summing up the achievements but primarily with throwing light on the role which the Agricultural Circles play in the rural areas.

Why the Circles?

In the rules of the Agricultural Circles we read: "An Agricultural Circle is a voluntary, universal, social and economic peasant organization, grouping peasants in work to increase and improve agricultural production by joining individual efforts with mutual aid and cooperation."

Further in the same rules we read that the objective of the circle is: "To improve production, profit, and agricultural methods on peasant farms, primarily through wide development of mechanization and water regulation (melioracja), raise the level of social and cultural life of the rural areas; organize and conduct many-sided economic activities; and defend the interests of the circle members."

Let us consider these formulations of the rules. It is not without reason that they stress several times that the prupose of the circle is to increase and improve agricultural production brings higher income, and this is of basic importance for the improvement of the living conditions of the peasants and raising the general culture of the rural areas.

Very well--it can be said here--but why should Agricultural Circles be the organizers of agricultural production; why should they deal with improving agriculture, and why should this not be done by the peasants themselves alone, each on his own land? In the rural areas there are supporters of the theory that an individual farmer is capable of independently increasing production to the level needed to satisfy even much greater needs.

In order to clarify this problem properly, it is necessary to move back a little. In 1954-1956 agricultural production increased by 25 percent and production for the market even by 36 percent. But recently this increase has been checked. This happened simply because the factors of production at the disposal of individual peasants have been exhausted. In order to push production forward, to cross that stumbling block on which our agriculture has stopped, new incentives and new and more productive factors of production are needed--first of all, machinery and a higher technical level of agriculture.

The fact that without modern techniques and without a high level of agriculture it will not be possible to increase production is probably understandable to everybody. The tractor must take the place of the horse, the digging machine must replace the shovel, the sheaf-binder the scythe. Can this be effected on individual farms? Or, conversely, can an individual farmer afford to purchas heavy machines? Certainly there will be some who can. It is no secret that many of the wealthier farmers have bought heavy machines, including tractors.

Until recently, out of 75 tractors operating in Lowicz Powiat, only four were in the possession of Agricultural Circles. And when in that powiat a wide discussion started on the subject of developing the circles and of using the Fund of Development of Agriuclture (Fundusz Rozwoju Rolnictwa), the private owners of machines shouted at all the meetings: "Collective use of machines is uneconomical and unjust." Why ? An involuntary answer to this question was given by one participant in the discussion: "A tractor makes an excellent business, he said. In fact, lending tractors for field work and for transportation in Lowicz Powiat and not only in Lowicz Powiat gave many owners big--very big--incomes. But let us ask at whose expense. Obviously at the expense of those who were forced to take advantage of these services. Such command over machines must lead to deepening social inequalities in the rural areas. And after all, we do not want that. In this way the level of weaker farms will never be improved.

Thus, there exists the necessity of looking for other solutions of the problem of progress in mechanization of agriculture. Under our conditions, with such small-size farms, this other solution is collective utilization of machines. And Agricultural Circles constitue precisely the peasant organization which can introduce such utilization of machines collectively on a large scale. We shall return to this problem, a most serious one for the favorable development of agriculture. The role of Agricultural Circles does not end in mechanization.

MAny of the errors of our agriculture cannot be removed without collective common effort of the peasants, without organizing mutual aid, without the most economical utilization of the serious aid which the state directs to the rural areas. Let us mention here briefly [water] regulation and development of breeding, increasing fodder stocks, better development of lands from the State Land Fund(Panstwowy Fundusz Ziemi), popularization of agricultural knowledge, improvement of commuanl conditions in the rural areas--supplying water, light, and many other needs of agriculture and the rural areas. These heavy and serious tasks can be solved only by unifying the efforts of the peasants, by strengthening state aid through the initiative and good management of the farmers. Such serious and urgent tasks can be started only by a universal mass organization which will be able to organize the productive and economic effort of the peasants. The Agricultural Circle is such an organization.

Who Is the Manager of the Circle?

The Agricultural Circles play a similarily important role as a social peasant organization. This social and educational role of the Agricultural Circles is generally less appreciated. What is mostly involved here? First of all, educating a farmer who loves his profession and has a high level of agricultural knowledge. A farmer who, in times of the unheard-of progress of technology and science, is able to farm better and more efficiently, in accordance with the needs, in order to live in better conditions. The circle not only introduces modern methods of farming into the rural areas but also serves as a social school of self-gorverning, collective action.

Here we reach the basic problem. How is a self-governing peasant organization defined?

Let us reach for the rules. According to them, the highest authority of the circle is the general meeting. Among the rights of the general meeting are passing the plan of activities, preparing the budget, deciding on acquisition of property, electing the executive [body], and evaluating its work, In a word, all the important problems of the circle are decided by the general meeting and therefore by all members of the circle. Thus, the rules state clearly: the peasants themselves are the managers of the circle.

Nevertheless, it is a fact that faith in a well-run self-government is not strong everywhere, in every village. Besides, this is not a new phenomenon. We do not yet have very rich traditions of a well-run self-government. We only have to learn this. In order for self-government to work justly and well, and in accordance with the needs of the whole village, certain conditions are indispensable. The first and most important one is undertanding the essence of self-government.

The problem is that every member of the Agricultural Circle should know, fully, understand, and be able to draw conclusions from the fact that he is, in the full meaning of the tern, the manager of his circle. The executive, in accordance with the rules, is elected by the general meeting. And again it depends only on the members of the circle to elect the bet men, known for their will and ability to work on the social field, for their concern for the interests of the whole village, and for the fact that they are honest, active, and energetic. Such men can certainly be found in every village and in every circle. These are very important matters. It is no secret that fear of corruption, racketeering, and bribery discourages many people from active work in the Agricultural Circles and from the very assumptions of collective work. The only medicine for a badly working of corrupted self-government is active participation of all members in the work of the circle. In other words, the correct activity of the circle depends on the attitude and the degree of interest of all its members.

But someone can say, "Very well, but 'above us' there are powiat and wojewodztwo associations, and also the Central Association (Centralny Zwiazek). Will they not interfere in our affairs and 'lead us by the hand'"? Let us consider this: after all, no circle or village is located somewhere on the moon--they are all in a specific powiat, wojewodztwo, and country. Each circle is connected by numerous common affairs with the powiat, the wojewodztwo, and the whole economy. Hence it is indispensable to coordinate the activities of the circles with wider, more general needs. It is indispensable to join the interests of every village with the needs of the powiat or wojewodztwo and with interests of the whole country. This is why the Associations of Agricultural Circles exist.

Thus, superior associations exist first of all in order to unify the undertakings of the circles, to coordinate them with the more general tasks, and to grant specific aid to the circles.

Only on these matters, on matters exceeding the limits of the village, are decisions made by the superior organizations, the powiat, the wojewodztwo, and the Central Association. But in no case can there be any possibility of "leading by the hand" and imposing on the circle any decisions on its own purely internal affairs.

Similar is the problem of the cooperation of the circles with the local authorities. It is clear that the economic activity of the circle should agree with the assumptions and directions of development of agriculture in the whole commune. Several matters require the cooperation of several circles and several villages. Such cooperation is indispensable and cannot be considered as a limitation on the self-government of the circle. There can be no siutation in which, for example, several villages in the same commune conduct together some major [water] regulation undertaking and one village in which the land requiring regulation is located will not take this work into account in its plan. Many other matters also require cooperation and agreement. Let us mention only the regionalization of seed blocks, exchange of seedlings, school construction, organization of network of milk coolection centers, etc.

What Do the Opponents of Progress in the Rural Areas Have to Say

The social nature of agricultural circles, and particularly the problem of team utilization of machines, is most strongly attacked by opponents of progress in the rural areas, opponents of everything that is new, that can bring a considerable improvement in the material situation of the widest masses of the peasants.

One of the "theories" rather universally voiced by them is the statement that "the circles were invented by the Party solely in order to draw the peasants into production cooperatives". It would be possible to dismiss such a statement with a shrug and to consider it naive or simply ridiculous. But in practical life even the most nonsensical theories find a following here and there.

What is the truth? Many times both our Party and the ZSL [Zjednoczone Stronnictwo Ludowe; United Peasant Party] in numerous statements and resolutions made it known that they did not intend to impose forms of farming upon the peasants. The farmers themselves decide how they want to farm.

We start here with the only correct assumption that passage to collective forms of farming--that is, to production cooperatives--can take place only on the principle of vountary action. That is, only and solely when the peasants themselves make the choice, when they themselves are convinced of the superiority of collective forms of work on land. Of course, Agricultural Circles play the part of a social educator of the rural areas, the role of a school which will develop habits of social thinking, collective overcoming of difficulties, and sincere cooperation of all inhabitants of the rural areas in work on the development of agricultural production and improvement in the welfare of the rural population.

Certain opponents, not only of collective use of machinery but of mechanization in general, try to spread the theory that under our conditions a horse is more profitable for the peasants than a tractor. But it is not difficult to disprove such statements. The farmers have practical possibilities of convincing themselves that, while, for example, the plowing of one hectare of land with horses costs 350 to 500 zlotys, the same hectare of plowing with a tractor of an Agricultural Circle costs only 235 to 275 zlotys. And the tractor, as is well known, does not eat fodder, while the increase in the number of horses in Poland had a very bad influence on cattle and pig breeding. As for the number of horses, we have a bad record: we have about as many horses as there are in the United States, and after all that is a country many times larger than Poland.

If we wanted in one word to define the role of Agricultural Circles, we could say that first of all they bring progress, all-round progress--economic, social, and cultural. Such is the basic assumption of Agricultural Circles; such is their prupose and program.

Who are the men who act against progress, against the development of the rural areas? Naturally, the situation is different in every village. But it is possible to find a common characteristic for all those men. Namely, it is dislike and often simply hostility toward all moves which have the purpose of improving the welfare of the whole village, of all its inhabitants. And this is for the simple reason that this threatens theri own material and social position in the rural areas, decreases their possibilities of enrichment, of grabbing the aid funds flowing to the rural areas, and hampers their "ruling" in the village.

It would be possible to find examples in almost every village. Let us limit ourselves to a single very significant one. In the village of Studzianki in Biala Podlaska Powiat the owner of a 50-hectare farm succeeded in taking advantage of the fact that water regulation work at state expense was being done in the village. The workers deepened the pond belonging to him and dug inflow and outflow canals. Thus the only access to fields of other farmers was cut by this canal. All these jobs, executed at state expense and benefiting only one farmer, involved considerable bribery. However, the peasants in Studzianki managed to deal with this. Fifty inhabitants of the village arrived on 15 carts and filled the canal while deepening and cleaning 1,800 meters of current regulation ditches serving the whole village. This is a rather extreme example but not at all isolated. Are there no similar examples in your own or neighboring villages? Has the amateur of enrichment at the cost of others really disappeared?

But it would be an exaggeration to maintain that only the exploiters hamper the development of Agricultural Circles. Many otherwise honest peasants still have no confidence in Agricultural Circles in general and in the collective use of machinery in particular. Apart from the activities of the open opponents of progress in agriculture, a considerable influence over such an attitude of many farmers is exerted simply by the fact that collective use of machinery does not have strong traditions in Poland. It is true that machine collectives existed previously, and it cannot be said that these collectives are of the nature of "cliques" or "partnerships." In most cases they were honest, well-run collectives rendering services to the villages. However, they differed considerably from the present form of collective use of machinery on the basis of purchase for the money from the Fund of Development of Agriculture. They had a group and not a social character.

Tendencies for group action are very strong in the rural areas. They became apparent through rot only the organization of machine collectives but also of collectives for the production of construction materials, establishment of plants for fruit and vegetable processing, development of land leftovers, [undeveloped land], etc. Usually this took place in such a way that a few of the more enterprising farmers created collective, but isolated themselves from the rest of the village and worked only for their own group profit. They cannot be accused of exploitation, although this, too, happened in certain cases. But, as is well known, the foundation of our agricultural policy is the improvement of production of all farms, the utilization of reserves inherent especially in farms with a lower level of agriuclture and less well equipped with means of production. For this reason we aim at collective utilization of machines which constitute the social property of the whole village and serve all its inhabitants.

In the era of the huge, simply fantastic development of technology and science, in the era of approaching interplanetary travel and of harnessing atomic energy, the need to modernize our agriculture should be universally accepted as a matter not even requiring discussion.

Collective Use of Machinery Has to be Learned

If there is no other way but collective utilization of machines, we have to do everything to develop this form of mechanization of agriculture, with the best productive effects. Primarily for this purpose, the Fund of Development of Agriculture was created, of which 75 percent is allocated to the purchase of machines.

The Fund of Development of Agriuclture constitutes a huge capital given to the Agricultural Circles, which by the end of 1965 will amount to about 25 billion zlotys. This sum will be increased by the contributions of the farmers themselves. The problem of contributions gives rise to various doubts in the rural areas. It is not so much the problem of the contribution itself as of its amount. Let us therefore consider why an indispensable condition for taking advantage of the Fund of Development of Agriculture is a 25-percent contribution in the old territories and 15-percent in the Regained Territories.

The virst basic problem is the fact that a contribution for the purchase of machines is a guarantee of better care for the equipment, not to mention the fact that it strengthens the sense of ownership of each circle member. But this is not all. The Fund of Development of Agriculture is not something that will last forever. Machines will also have to be bought after the fund is exhausted. Thus, it is necessary to develop among the farmers the habit of contributing their own money for the purchase of machines.

As for the volume of these contributions, it has first of all to be explained that 10 percent of that 25 percent constitutes prepayment for the use of machine services. Here too, the objective is similar, for any economic activity of the circle must be profitable. This applies also to operation of machines. The farmers taking advantage of machine services must realize that a tractor is not an indestructible machine, that after a certain time a new one has to be bought. It is also necessary to make repairs and to buy spare parts. Thus, in order to manage well the social machinery equipment, it is necessary to collect funds for repairs and purchase of new machines. And these funds can be collected only through proper payments for the machine services, taking depreciation into account.

In addition, the amount of the contributions is strongly influenced by the number of the circle members who pay these contributions. A simple calculation shows that if 25 percent of the cost of the same assembly of machines is contributed by 50 farmers, each of them will pay less if only 15 farmers join [sic]. And what happens if at first only a few members of the circle declare their contributions while later there will be many more contributing members? The contributions paid earlier by the minority will not be lost. Counted as a contribution will be only the amount which is due, taking into account all members. Anything that remains will be credited for charges for machine services.

There are no obstacles to allocating for the purchase of machinery from the FRR [Fundusz Rozwoju Rolnictwa; Fund of Development of Agriculture] money jointly earned by the circle, treating it as a loan for less wealthy members. These could be profits from collective brick-making, development of land lef-overs, or other economic activity of the circle. It need not be added that every circle has such possibilities. Everything depends solely on the energy, enterprise, and initiative of circle members. Thus, in this way too it is possible to cut the monetary contribution considerably.

We do not wish to discuss here in detail all the matters connected with using FRR and collective machinery. They are discussed thoroughly in the Directives issued by the Central Association of Agricultural Circles (Centralny Zwiazek Kolek Rolniczych). We only stress here that the preparation of the circle for the acceptance of assemblies of agricultural machines is an essential condition of success of the mechanization. Involved here are such difficult problems as training tractor men; preparation of technical facilities, workshops, and properly equipped smitheries; construction of buildings to house machines, supply of spare parts and fuel; preparation of men for keeping accounts connected with operation of machines and with the economic activities of the circle in general; organization of care of the social equipment, and many other matters. In brief, it is necessary that the machines reach a well-prepared circle, giving a guarantee that the collective mechanical equipment will be used properly and to the advantage of the whole village.

We speak about this because this necessity for good preparation of the circle for the receipt of machines forces the associations of Agricultural Circles to concentrate their organizational efforts in those villages which will obtain the machines this year. But this does not mean that in other villages all activities should be discontinued and the villages should be left to themselves. The activities of Agricultural Circles are not limited solely to mechanization.

The Main Tasks

The most serious peasant organization today is facing difficult and urgent tasks in the field of raising the level of agricultural production. In using the work "urgent," we have in mind the daily intensive work of the circles as organizers of production.

What are these main tasks?

Apart from mechanization of agriculture, which we discussed in detail previously, one of the most basic matters is water regulation. By the end of 1965 we wish to regulate--in accordance with the assumptions--720,000 hectares, reconstruct regulation installations on 300,000 hectares, and introduce post-regulation development on over a million hectares. In addition, the plan provides for the execution of regulation work on 1.8 million hectares of agricultural land. For this purpose the state allocates the huge sum of 17 billion zlotys, not counting here the sums from the Fund of Development of Agriculture which the peasants themselves will allocate and their own contributions. Naturally, the realization of such huge targets will require an enormous organizational effort, and not only on the part of the state and the state enterprises and industry. The matter must also attract the attention of Agricultural Circles.

Let us mention here in a few words what steps were taken to ensure the reality of these serious endeavors. In the next few years the industry will produce modern dredgers--single- and multi-bucket ones, machines for cleaning draining ditches, plows for ditches, and many other highly productive machines not previously produced in Poland. The production of the urgently needed drainage pipes will also increase by several times.

This serious state effort must be intensified by collective mass effort of the peasants. There is almost no village that would not be directly interested in regulation work. Regulation means not only the intensification of productivity of meadows and pastures but also higher crops on arable land.

In order to show better the importance of this problem, let us quote the following data. In accordance with the assumptions, in the central and southern wojewodztwos each village will have an average of 33 hectares of new drainage. In the western and northern territories, the majority of jobs will concern first of all renovation and maintenance. This means that on an average, in each village the value of regulation investments, including basic regulation work, will be half a million zlotys. These figures indicate the extent of the regulation projects.

What are the tasks of the Agricultural Circles in this field? The Agricultural Circle is the organizer, joining the efforts of the peasants, mobilizing the public opinion of the village, joining the strength and resources of the peasants to effect these important targets. How should this be done? Again according to terrain and local conditions, it is necessary to start by defining the most urgent needs, by giving opinions and co-decisions on the plan of regulation jobs and on their direction and type. It is necessary to add immediately that the circles must be helped by regulation experts. With their aid it is necessary to design the harmonogram of jobs; to determine the contribution of the village in money materials, and labor; to watch the course of the work; and to supervise the realization of the declared contributions. So much as concerns new jobs.

Another problem--not less important--is seeing to the proper development of the regulated greeen usable land and also the maintenance of regulation installations. As for maintenance, the circle may make contracts with the regulation enterprise. Water partnerships will help the circles here. The circles have an ally in water partnerships and direct help in the work of realizing the regulation goals.

As is well known, a part of FRR funds, not exceeding 25 percent, can be used for regulation purposes--that is, for regulation and development of lands constituting commune property or lands which the circles take from the PFZ [Panstwowy Fundusz Ziemi; State Land Fund] for collective use. It can also be used for exploitation of peat bogs and development of former peat bogs. It is also possible to purchase machines for regulation and meadow work from that part of FRR. But in these cases too there are conditions: namely, in regulation work on commune lands the FRR money can cover only 20 to 55 percent of the total cost. The remaining part must come from contributions of the users.

Skillful and most effective utilization of the FRR funds for regulation work is one of the main tasks of Agricultural Circles. In addition, the circles should make exhibits of rational development of medows and proper care of water installations and should organize competitions of post-regulation fertilizing, propagation of cultivation of quality grasses, etc.

We have already said that there is a rather considerable acreage of usable land poorly developed and cultivated having really no proper caretaker. We currently have in Poland over 800,000 hectares of such mostly "wildly" developed lands. Many tenants pursue [on such lands] improper farming, designed for fast profit. We cannot afford such waste. These lands must find a good, honest farmer who will be able to get high yields from them. Mostly involved here are larger lots of land, so-called estate "left-overs," and also parts of lands from the so-called Group C, transferred by the PGR [Panstwowe Gospodarstwa Rolne; State Farms] to the State Land Fund. Naturally, these lands cannot be developed by individual farmers. But this certainly can be done by Agricultural Circles.

The present achievements of the circles in this field are not great. The circles have taken over [only a little more than 20,000 hectares for collective cultivation. The main cause of this was the fact that under present conditions the circles could not always deal with this. Lack of machines was the main obstacle. In addition, not all circles known the attractive terms on which they can take on a long lease or purchase the land from the PFZ. But at present the situation is different and better--first of all because the circles now have more machines and they can use some FRR funds for the development of left-overs.

A few words about the terms on which the circles may take over lands and buildings from the PGZ. The circles may obtain, first of all, free land that are undeveloped--or for which the contracts for use have not been extended; lands utilized by cultivation collectives or by individual users who farm poorly, do not use the necessary agricultural methods; and lans transferred by the PGR to the State Land Fund. Circles taking over land for collective farming receive considerable relief in taxes and contributions. Also, rent payments are exceptionally low--10 kilograms of rye per hectare. If the circle takes over for farming at least 20 hectares of land from PFZ, there is also a cut in the contribution for the purchase of machines from the FRR from 25 percent ot 20 percent in the old territories and from 15 to 10 percent in the Regained Territories. In addition, a part of the FRR funds can be devoted to investments in the left-over lands--for example for starting an orchard, developing fish ponds, constructing hothouses or buildings to house machinery, or processing plants, etc.

Thus, the terms are very favorable. And the advantages? Let us give some examples here. The circle in the village of Krzyzowice, Glubczyce Powiat, developed collectively 23 hectares of land from the PFZ. It obtained 100,000 zlotys in profit from this. But not only profit is involved here. The circle supplied not only its members but also the remaining villagers with excellent seeding material produced on those very lands. After payment of all dues, the circle in Krzyzowice bought a television set, organized a community hall, and allocated sums for permanent cultural work in the village.

Another example: The agricultural circle in the village of Zaksin (Szczecinek Powiat), purchased a tractor with the money obtained from the developed PFZ alnds. A fine example of good management on PFZ alnds was given by members of the agricultural circle in Wielka Zla Wies, Torun Powiat. They raise on these lands qualified rye, brewery barley, and oat seeds and seedlings. In addition, they started a highly profitable plantation of seed grasses. Thanks to this, not only this village but the whole neighborhood uses excellent seeding material, which naturally has a considerable influence on increasing crops. It is possible to give many such examples.

How then should this work be started? In the old territories the main problem is li ited to finding badly farmed land or land not farmed at all. In agreement with the people's councils, it is necessary to determine the location of arable lands or usable green lands which the circle could farm. These are not always the best lands. But the main problem is to improve agriculture on these lands, to get better crops. And where the necessary conditions exist it should be endeavored to transform the left-overs into well-managed seeding, vegetable, or orchard farms.

Directly connected with the problem of collective farming by agricultural circles of PFZ lands is another important task--better seed management. We know what a small percentage of the peasants use high quality seeding material. It is enough to say that by the very quality seeding material. It is enough to say that by the very replacement of the currently used seeds with highly qualified material, in both grain cultivations and industrial, and pasture plants, we can increase the yields very considerably.

It is in this field that agricultural circles have much to do. Regardless of the establishment of seed blocks and the introduction of mass reproduction of seedlings, it is also necessary to conduct other organizational and propaganda work. The circles must make an effort to increase the production of seeds by establishing seeding blocks and also organize collective purchase of seeding material. Again it is necessary to start by investigating how the current situation in every village. The circle should check on who in the village is using qualified seeds or seedlings and what crops he gathers as a result and who suffers losses by not using good seeding material.

It is necessary to talk to those people and to convince them of the advantages of using choice seeding material. But this is only the beginning. The circle must also make sure that the village is able to purchase such seeds. Here it is necessary to start wih its own region and make contacts with the PGR, the production cooperative, and scientific institute --in a word with farms producing seed. Agreements should be concluded and seeds or seedlings purchased collectively.

In collecting orders from peasants, the Agricultural Circles should also concern itself with the proper regioning of varieties and the purchase of the most suitable material for the given area. A further very important element is the creation of seed farms in the village. Here too the main part will be played by the Agricultural Circle. It is necessary to choose farms to specialize farms in the production of individual varieties, to give them expert aid, and to help them in obtaining seeds, proper fertilizers, and means of plant protection.

This last problem, that of combatting plant diseases and pests, is also an important source of production reserves. The losses which we suffer as the result of badly organized, incomplete, and not universal pest and disease control reach many billions of zlotys a year. What can the Agricultural Circles do in this field? The circles may become the main organizers of the fight against pests, not only through propaganda work and convincing farmers about the necessity of plant protection measures but also through well organized activities. This means obtaining proper chemicals, organizing brigades of plant protection and supplying them with equipment, organizing collective programs to combat the most important pests: Colorado beetle, pollen beetle, and beet beetle. The circle must also organize a universal mass weed extermination program.

Obviously, this does not exhaust the tasks or possibilities of the circles. As we said in the beginning, the construction needs of Polish rural areas are enormous. Despite the generous state aid and despite the ever larger quantities of construction materials directed to the rural areas, we have not yet achieved any marked progress in rural construction. Here too the collective effort of the peasants is necessary; it should be well organized and based on planned, honest economic activity.

The circles can do much to organize teams producing construction materials. The experiences and achievements of circles in this field are already considerable. But not only construction materials are involved. The circles can also organize collective construction. It is probably not necessary to explain at much length that if a score of peasants start construction simultaneously the costs will be lower. It is possible to organize common transport, to help each other in construction, and to settle jointly any necessary formalities, as well as in getting exper advice. Generally, the peasants have nobody to ask for advice when they want to construct, for example, a good hem house, pig sty, or cow shed. They have to be helped and be told where they can get typical documentation on various farm buildings.

There are many other tasks and problems requiring considerable effort on the part of the Agricultural Circles--for example, fodder management. How many farmers do not know the basic principles of rational feeding of livestock and do not appreciate the importance of such cultivations as corn (fodder corm). The cultivation of highly efficient fodder plants is an important and immediate measure for easing fodder difficulties. The farmers have to be told this and to be convinced that, for example, corn gives many more feeding units than fodder beets, that it will also pay well under our conditions.

But in order to convince the farmers about this in areas where the cultivation of this plant still has no traditions, much propaganda and organizational work is necessary. The establishment of experimental fields, expert aid in taking care of sowing and harvesting, and first of all the construction of silos for corn--these are the indispensable conditions for the popularization of this plant among the peasants.

We all remember the time when, with aggressive and not well prepared propaganda concerning this plant, we discouraged many farmers from raising it. The peasants became discouraged, not because corn under our conditions does not have major development chances or does not bring high and profitable crops. This happened mostly because, in introducing this plant into our fields, all the conditions necessary to attain good yields were not properly prepared.

What are these conditions? First of all, supplying planters with good seeds, adapted to our soil. Next, organization of agrotechnical aid in corn farming and tending; then proper fertilizing; and finally, mechanization of equipment. But this is not all. In order to derive full advantages from corn cultivation, every farmer who introduces it in his fields must have a silo and elementary knowledge of silage preparation. Without this there will be no results. According to the production assumptions for 1960, corn cultivation in Poland is to increase to 155,000 hectares, including 70,000 hectares in the PGR. Thus, there are over 80,000 hectares for individual farms and production cooperatives.

In the realization of this target we count to a large extent on Agricultural Circles. The tasks of the circles in thsi field are considerable. The circles may deal with collective ordering of seeds, opening of experimental fields of corn cultivation, ensuring planters of agrotechnical aid in cultivation and fertilizing, provision of machinery for equipment, and helping in setting up silos and preparing silage from the green mass. The populatization of corn cultivation is also an important task for the activists of the Agricultural Circles. There are numerous arguments.

We also have excellent results in Poland. For example, in the Zaborow PGR (Pruszkow Powiat), 800 quintals of green mass per hectare were harvested. With this it was calculated that the cost of producing one quintal of corn is one third of that required to produce one quintal of fodder beets, when 500 quintals from hectare are harvested. We can show here an interesting example of our neighbors [achievements]. In Cottbus Bezirk in East Germany, which has conditions similar to those in Poznan Wojewodztwo, the acreage of corn cultivation consititues 9 percent of the total arable land. Thanks to this, the number of cattle per 100 hectares is high--75 heads. On the other hand, in Poznan Wojewodztwo corn is cultivated on only 0.2 percent of the acreage and there are only 45 heads of cattle per 100 hectares. A comparison of these figures speaks for itself.

But an improvement of the fodder base and easing of the acute fodder shortage means not only an increase in corn cultivation. To a large extent, this also involves the problem of potatoes. We know well that potato yields in Poland are vary low and have remained for years on the same meager level, despite the fact that our country has excellent conditions for attaining much better yields. The Agrciultural Circles can do much to increase potato crops in Poland. They have considerable experience in this field. Agricultural Circles in Poznan and Bydgoszcz Wojewodztwos collectively purchased excellent, healthy seedlings in Koszalin Wojewodztwo, where there are excellent conditions for potato cultivation. As a result, even under the very unfavorable 1959 conditions, the members of those circles had comparatively high yields--over 135 quintals per hectare, where in 1958 they had only 102 quintals per hectare.

However, they did not limit themselves to getting the seedlings. For example, in Gostyn Powiat the circles organized obligatory spraying of potato fields, with or without the consent of the owner. Only this kind of pest control can give the desired results. What is the use of destroying the Colorado beetle on a small section of the field if elsewhere in the neighborhood the pest thrives unhindered? Therefore, the Agricultural Circles, by organizing the supply of seedlings for farmers and combating pests and diseases, can do much to improve the potato crops in the whole village.

These incomplete and only briefly listed tasks of Agricultural Circles in the field of organization of agricultural production given an idea what all-round advantages the social activity of the peasant organization may bring to agriculture.

Mechanization Plus Agricultural Knowlege

No less essential and no less important are the tasks of the Agricultural Circles in spreading agricultural knowledge--particularly among the young. The rules of the circle mention this. In Article 11 we read: "The Agricultural Circle supports and encourages initiative among the young, enables them to gain agricultural knowledge, and helps in developing cultural, educational, social and economic activities." Today in the rural areas one hears many complaints about the "escape of the young from the village," the disinclination of the young to work the land. One of the main causes of this is nto alone--as is generally maintaned--[a desire to] escape from hard work on the land. Probably an equally important cause is the free evenings when there is nothing to do, when the young people are simply bored.

The filling of these evenings with well organized, systematic, and interesting educational work is an excellent medicine, and not only for boredom. Improvement of agricultural knowledge certainly creates interest in work on the land and generates love for the profession of the farmer and respect for this difficult work, which requires--contrary to general belief--high skills. Agricultural education does not mean only expert knowledge--it also means a different look on all the problems of agricultura. The views on farming of a young man who knows agriculture only from his own yard, to whom neither knowledge nor progress have any access, are different from those of a boy who graduated at least from a school of agricultural preparation. There is no need to cite here the numerous examples of activities of teams of agricultural preparation or graduates of two-year winter agricultural schools.

It is more and more often the young men who introduce new methods of cultivation and breeding on the farms of their parents.

It is for this reason that cooperation of Agricultural Circles with the Association of Rural Youth (Zwiazek Mlodziezy Wiejskiej) and with teachers in spreading agricultural knowledge is of such great importance. The circles may help the PR [Przysposobienie Rolnicze; Agricultural Preparation] teams in supplying seeds, fertilizers, and construction materials and in allotting experimental fields. They may make machines available to young people studying agriculture and may grant scholarships to those studying in agricultural schools.

But not only the young should be educated. Again it is not necessary to convince anybody that the level of expert knowledge among the adult farm owners varies greatly. There are many farmers with high qualifications who know how to take advantage of modern achievements of agricultural science. But there are also many who stubbornly adhere to traditional, obsolete methods of farming. Thus, the Agricultural Circles may and should become organizers of agricultural training: they should organize talks, lectures, and evening shcools; establish experimental fields, exemplary cow sheds and pig sties; and organize breeding shows and competitions. The Agricultural Circle also has wide possibilities for starting cooperation with agricultural research and experimental centers, with agrotechnicians and employees of agricultural institutes --in a word, with men who, because of their education and professional work, represent a high standard of expert knowledge.

The tasks of Agricultural Circles in popularizing and making practical application of agricultural knowledge are as wide as the possibilities for their execution. Everything depends primarily on the initiative and enterprise of the circle members, on the extent to which they understand that neither mechanization nor any other productive effort will give results without a proper level of agricultural knowledge.

The winter period is the best time for organization work. The Agricultural Circles have enough time to prepare for the difficult tasks which it will have to be realized in the spring of this year. In this organizational and preparatory work the activators of all programs should first of all be the members of the Party and of the ZSL, activists of the ZMW [Zwiazek Mlodziezy Wiejskiej; Association of Rural Youth], and employees of the agricultural service. But the problem is that the Party and ZSL activists should play their part primarily in the circles and not--as often happens--outside of it. In other words, a Party member living in a rural area must join the [local] Agricultural Circle. The correct development of the circles in accordance with the interests of the village can be watched only by an active member of the peasant self-governing body. Watching the moves of the circle from outside will not lead anywhere. This must not be forgotten.

Let us also remember that the main, fundamental task of the Agricultural Circles, which is increasing and improving production, is not an end in itself. It is only an effective means of improving the living conditions in the rural areas. The understandable tendencies of the peasants to improve their living and cultural conditions, to make the Polish village a brick village; to throw away the oil lampsl to cease making motorcycles, television sets, washing machines, and even automobiles a rare sight in the rural areas; to make highly efficinet machines replace more and more the maual labor of men--all these desires are reasons for the peasants to unite in Agricultural Circles.

The majority of farmers know even today that only a unified effort of peasants, well organized and directed, may lead to such a village of the future. But it is necessary that all should fully understand this, and especially those who today still entertain some doubts. It need not be added that the best and most convincing argument is the practical, good, and fruitful activity of the circles. In the work on improving and perfecting agricultural production, the circles are not alone. Each circle may count on all-round aid from experts and activists, people's councils, associations of agricultural circles, rural cooperatives, social organizations, scientists, and teachers. But even all-round and well organized aid will give good results only when all members of the circle do active work, with initiative and good management, and when they persuade the whole village to cooperate.

We want the level of our agriculture to be high and for our land to be cultivated by educated, progressive farmers, taking advantage of the modern means of production and using the best methods of farming and breeding. In the attainment of this objective large and responsible tasks fall to the Agricultural Circles.

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POLAND

Information on Railroad Passenger and Freight Traffic in 1959

[This is a translation of an article by Magister Mieczyslaw Zajfryd, Director of Central Administration of Haulage (Centralny Zarzad Przewozow) MK [Ministerstwo Komunikacji; Ministry of Transport] published in Przeglad Kolejowy-Przewozowy, Vol XII, No 1, January 1960, Warsaw, pages 2-7; CSOL 3746-N]

We have the year 1959 already behind us. It seems that it will be desirable to analyze certain phenomena which took place in the work of the haulage service last year in order, on the basis of conclusions stemming from this analysis, to be better able to organize our activities in the current year. This is especially necessary in view of the fact that this year's plan for the haulage service contains not only very mobilizing targets concerning the haulage service and the indicators characterizing the quality of this work, but also--and this deserves special stress-very limited resources for the execution of these tasks, particularly in the field of employment. A plan prepared in this way, being a logical consequence of the implementation of the Resolutions of the Third Plenum of the PZPR [Polska Zjednoczona Partia Robotnicza; Polish United Workers Party] in the whole national economy, must absolutely be executed by our service.

Passenger Transportation

Last year, rather essential changes took place in passenger huals. On 15 June 1959 new increased fares for the transportation of passengers and luggage were introduced and on 1 October 1959 the prices of monthly workers' tickets were increased, and at the same time the method of covering the charges for these hauls was changed.

The increase in fares had the objective, on the one hand, of checking the constant and in most cases unjustifiable increase in travel and on the other hand, of basing the fares on the railroad's cost of production.

The reform of fares facilitated the attainment of the intended objectives but at the same time placed several important duties on railroad transport.

The first duty is a definite improvement in the quality of railroad services in passenger hauls. At present--that is, since the reform--the state treasury no longer subsidizes every haul. The total cost of the haul is included in the far and the passenger has the fullest right to demand proper conditions of travel. Of course, this does not mean that there was no such duty before the reform. The duty existed before too, but, in view of the subsidizing of hauls, it did not appear as sharply and acutely as after the reform. For this reason we have to view quite differently the problem of improving the quality of work connected with passenger transportation.

In our further work we can no longer tolerate various kinds of minor or major shortcomings which disturb the peace of the passengers, annoy them, and result in the trip, instead of being a kind of pleasure, often becoming a hardship. We must create conditions under which the traveler can always obtain the necessary information on train connections, buy a ticket without unnecessary loss of time, leisurely occupy his seat in a car that is clean, properly lighted, and heated, and reach his destination punctually and according to the time table.

Thus, as we see, the requirements of the traveler are not great, but they have to be properly fulfilled by the apparatus of the haulage service.

The second duty imposed on us by the reform of passenger fares is to take care to assure the railroad of revenues from passenger hauls. The increase in fares, though it led to a considerable increase in unit revenues (that is, on the average per passenger-kilometer), simultaneously caused a certain decrease in the number of hauls, primarily in the first class. From this fact stems the conclusion that, in order to prevent a drop in revenues from passenger hauls than planned in 1960, we must still intensify the struggle against trips without tickets and collect the fares from passengers found without tickets in a still more energetic way.

Table 1

Execution of the Plan of Passenger Hauls in 1959

	Execution of Plan in Percent		
	First Half of Year	Second Half of Year	Year
Train kilometers	98.6	101.2*	99.9*
Passanger-kilometers	98.3	82.4*	90.0*
Revenues from passenger hauls	96.5	82.1*	87.4*

*Estimated data

Neither can we forget about the necessity of soliciting hauls, of course under conditions profitable to the railroad, utilizing for this purpose first of all the planned trains in period of less dense traffic.

Closely connected with the duty of collecting the revenues for hauls due to the railroad is the effort to constantly lower the costs in passenger traffic. It is absolutely impermissible to tolerate a situation in which, with a drop in hauls and revenues, the costs of passenger traffic remain unchanged or drop at a slower rate than the revenues. To prevent this, it is necessary constantly to analyze the passenger volume on trains on all levels of the haulage servoce and to introduce immediately the necessary measures in the form of decreasing the size of trains, temporary or permanent concelation of unpopular trains, running of mixed trains, elimination of stops, transfer of hauls uneconomical to the railroad to the PKS [Panstwowa Komunkacja Samochodowa; State Motor-Vehicle Transportation], and similar measures.

The practical application of these measures of 1959 left much to be desired. In many cases we lacked sufficient initiative, as a result of which some measures were applied too late, and in consequence reduced the final effects of the steps undertaken. The duty to execute hauls with the lowest labor and material outlays is one of the basic tasks of the haulage service.

In analyzing our work of last year, one still has to deal with the problem of regularity of train runs in passenger traffic. Intensive work on the part of the whole haulage service apparatus and ever sharper sanctions against employees guilty of causing delays of passenger trains gave some results.

There was a great improvement in this field (Talbe 2), but it is still insufficient.

Table 2

Percent of Passenger Trains Arriving on Schedule in 1958-1959

Regularity of Passenger Trains	First Quarter	Second Quarter	Third Quarter	October-November	January-November
1958	92.8	95.5	95.2	94.9	94.5
1959	95.4	96.4	95.1	94.6	95.5
1959:1958	102.8	100.9	99.9	99.7	101.1

Closer studies of the causes of delays of several long-distance trains on the whole PKP [Polskie Koleje Panstwowe; Polish State Railroads] network conducted last year showed that it was necessary to further intensify the discipline in passenger traffic in all operational PKP services.

These studies have also shown that it is necessary to introduce in the train timetables certain suuplements which would enable and at the same time oblige the engineers to liquidate short delays resulting from unexpected causes. In connection with the above, the service timetable in force from 29 May 1960 will contain, among other things, two travel times for the trains--normal time and shorter time--and the shorter time will be obligatory to the engine team if the train is late. Such a construction of the timetable should contribute to a further improvement in the regularity of the run of trains which, with regard to passenger hauls, is the most important check on the quality of railroad work.

Freight Hauls

Last year was characterized by an unusually heavy movement of freight by rail. A considerable increase in industrial production, an increase--particularly in the second half of the year--in the turnover of foreign trade, and an increase in transit hauls both from East to West and from North to Sourth--all these advantageous phenomena in our national economy resulted in above-plan hauls on the PKP (Talbe 3).

Table 3

Freight Hauls in 1959

Data	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
National Economic plan, in million tons	56.5	61.0	62.5	65.0	245.0
Execution in million tons	58.9	63.0	64.0	66.1*	252.0*
Percentual execution of plan	104.3	103.5	102.5	101.5	102.9
Hauls in 1958, in million tons	54.6	57.8	59.9	65.1	237.5
Increase in 1959 over 1958, in percent	107.9	109.9	106.8	101.4	106.1

*Expected execution

The first statement that comes to mind in an analysis of the freight hauls last year is undoubtedly the fact of the almost complete utilization of the rolling stock throughout the year without long periods of slackened demand for cars, which in the past years caused incomplete utilization of the haulage capacity. This fact shows that the pressure exerted in the beginning of the year by the haulage service on shippers to influence them not to postpone hauls to later periods but to load immediately all the products which could be shipped gave positive results and contributed heavily to the 1959 structure of hauls.

This is a very important finding and should become an incentive for us toward still more energetic work this year, when the most uniform distribution of the product mass is the basic condition for the transportation of the planned total of products.

Last year we noted the phenomenon of a prolongation of the average distance of hauls per ton of shipments, not only with regard to the plan but also the execution in 1958 (Talbe 4).

Table 4

Average Distance of Hauls per ton of Shipments in Kilometers

Type of Shipment	1957	1958	Plan 1959	Expected 1959 Execution
Total shipments	232.8	239.7	234.5	241.1
Coal	227.6	236.4	235.6	234.0
Grain	235.1	201.3	205.0	210.0
Ore	265.9	259.5	252.7	258.0

The prolongation of the average distance of hauls, despite the introduction of patterns of rational flows for several loads, is a disadvantageous phenomenon. It increases the social cost of hauls on the scale of the whole national economy and it also influences adversely certain indicators characterizing the quality of railroad work, first of all prolonging the turnover of a freight car. For this reason this year we need a more penetrating analysis of the transport needs of individual economic regions from the point of view of restricting too distant hauls in both receipt and shipment of loads. The problem should be dealt with first of all by the administrations of hauls of the individual DOKP [Dyrekcja Okregowa Kolei Panstwowych; District Administration of State Railroads], which so far have not been sufficiently interested in the problem of rationalization of hauls.

It seems that, in connection with the necessity of decreasing the average distance of a haul, it is necessary to consider the desirability of restricting the transport of aggregate over short distances. Lack of truck rolling stock and the difference in freight rates in comparison with those for railroad transport result in the fact that, in order to by-pass the prohibition on transport over short distances, aggregate is brought from distant places--which, after all, was not the intention of the ordinances regulating this problem. The existing state of affairs retards the development of aggregate production close to the places of its consumption.

Much attention must also be devoted to an analysis of the rationale of hauls of products loaded in covered cars, first of all grain and grain products, for which the average distance of hauls shows a very considerable increase in 1959 as compared with 1958.

In speaking about the rationalization of hauls, one cannot ignore the important problem of tolerating certain not vital public loading places and route and station sidings. The present passive attitude toward this problem displayed by the majority of executive units, manifested in waiting for ordinaces basically regulating the conditions of closing sidings and loading places, must be changed. It is necessary that the individual service units, without waiting for orders from superior authorities, should lead, in agreement with the bodies of local administration and the interested railroad users to a gradual liquidation of all these loading places and sidings whose maintenance affects the interests of the whole national economy. However, the success of this action will depend on whether we succeed, in each specific case, in proving that the existence of one or another loading point is really contrary to general interests. For this reason every outside move must be preceded by a penetrating analysis which should provide proper arguments.

Among the indicators illustrating the work of the rolling stock, the coefficient of freight car turnover first of all requires analysis. The shaping of this indicator in the individual quarters of 1958 and 1959 is presented in Table 5.

Table 5

Coefficient of Turnover of Freight Car in Days

Year	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
1958	5.14	4.91	5.10	5.07	5.06
1959 plan	4.94	4.85	4.90	4.91	4.90
1959 execution	5.26	4.87	4.95	5.06*	5 03*
1959:1958 execution	102.3	99.2	97.1	99.8	99.4

*Expected execution

The 1959 results, although they show a certain improvement in comparison with 1958, nevertheless testify to a serious nonexecution of the plan concerning this indicator. The results attained are too small in comparison with the efforts of the haulage service to improve the car turnover. Many objective causes of a structural nature contributed to this--for example, increased transfers of empty rolling stock to cover the above-plan demand for coal mining, seaports, and frontier reloading stations, or an increase in the average distance of hauls resulting, among other things, from increased transit and import. The increase in the average distance of hauls above the plan alone deteriorated the turnover of cars on an annual scale by at least 0.05 days. Nevertheless, it has to be stated that the prolongation of turnover was also influenced by the deterioration of the regularity of runs of freight trains, which had a negative influence on the stopovers of cars in trains at transit stations.

In connection with the above, it would be possible to ask what were the results last year of the efforts made by the entire haulage service apparatus to improve rolling stock management. In order to answer this question, let us look at Table 6.

Table 6

Elements of Turnover of Cars

Elements of Turnover	First-Third Quarter 1958	First-Third Quarter 1959	Difference in Hours
Effective time of travel in train	11.84	11.95	+0.11
Stop at intermediate station in train	9.27	10.36	+1.09
Stops during loading activities	12.93	12.57	-0.36
Stops outside of loading activities	87.16	85.60	-1.56
Total	121.20	120.48	-0.72

It follows from this that there was a cut in the stops of cars at loading points and also at technical stations, which counteracted losses resulting from the increase in the distance of hauls and irregular runs of trains.

Among other things, this is a result of a very rigorous observation in the second half of 1959 of the principle of the best utilization of the second half of the day for loading activities. The widespread application of the principle of not sending empty cars to stations at which there are or will be unloaded cars contributed to cutting the stopovers of cars. For this reason also this year we must fully observe the above-mentioned and well tested method of work.

The stopover of a car, apart from loading activities, is an element which, in view of its share in the turnover, contains the largest reserves for speeding up the turnover. The time a car is stopped depends to a large extent on the method of organization of transportation of loads, which is expressed in Supplement IV to the service timetable. In the timetable now in force, the organization of the transportation of loads is based in principle on single-group trains running between dispatch stations. The number of trains which are more than single-group ones (particularly four-figure trains) is insignificant. Such an organization of hauls is easy and simple to execute but nevertheless it causes several comparatively long stopovers of shipments at dispatch stations before they reach their destination. For this reason,in order to utilize reserves contained in the stops of cars outside loading activities, we must gradually modify Supplement IV in the direction of introducing into it the largest number of multi-group long-distance trains, though we all realize that this is not easy and that will often encounter considerable difficulties because of the technical possibilities of dispatch stations.

The timetable which will become valid in May of this year will already contain a much larger number of long-distance multi-group trains than before. We must ensure that these trains are sufficiently cared for, properly assembled, and run according to plan.

We must also utilize the time between now and the next timetable conference to analyze the flow of loads and the possibilities of stations in order to increase materially the number of long distance multi-group trains in the next timetable.

This year we must investigate in great detail the causes of the deterioration of the turnover of special cars, the majority of which do not belong to the PKP, and the turnover of which influences the turnover of PKP cars. It will also be necessary to determine why the work of special cars was inferior to that of 1958 and remove these causes in order to execute the planned tasks in the field of turnover of cars in 1960.

The problem of the economical utilization of cars consists not only of speeding up their turnover. Another very important factor is the utilization of the loading capacity of cars. Taking into account the data contained in Table 7, the situation in this sector of work of our service is rather advantageous. However, sample studies show the existence of certain reserves, particularly in loading products from the groups "remaining" and lumber. The utilization of these reserves is also one of our tasks in the current year.

Table 7

The Coefficient of Static Loading on the PKP

Year	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	First-Fourth Quarters
1958 in tons	18.55	18.68	18.76	18.95	18.74
1959 plan in tons	18.64	18.95	18.87	18.74	18.80
1959 execution in tons	18.85	18.98	19.02	19.15	18.94
1959:1958 in percent	101.6	101.6	101.4	101.1	101.1

One of the most difficult and at the same time most urgent tasks of the operational services, and first of all the haulage service, is an improvement of the regular run of freight trains.

Under the present economic conditions of the country an intensified struggle for improved regularity in freight traffic is most urgent. A definite improvement in regularity entails, besides speeding up the turnover of cars, efficient management of engineer and conductor teams. Last year irregular runs cost the train teams many hours of the time allocated by law for rest and the state treasury spent large sums for overtime remuneration. Improved regularity would also mean better utilization of locomotives of which the shortage resulting from the slowness of industry in delivering them in the past few years and the rapid increase in hauls in recent ti es is felt ever more acutely.

The new timetable prepared during the conference in Sopot takes into account the postulate of increased coordination of haulage work with track maintenance jobs. Maintenance and investment services do everything they can to prevent exceeding the time allocated to the jobs during which the track must be closed. The traction and car services will also increase their supervision over the technical state of the rolling stock. The rest is up to us. It depends on our evaluation of the traffic situation, our conscientious execution of service duties, and initative in overcoming difficulties, whether we will obtain an improvement in regularity and to what extent.

Better utilization of locomotives and teams of collective trains and an increase in the commercial speed of these trains should be greatly helped by the 150-horsepower combustion locomotives already received from industry. Their operation, as a new problem, requires special care, because the line has no experience with these locomotives; there is thus a danger of uneconomical utilization of the locomotives and the operating personnel, and consequently a failure to achieve the intended effects of the application of this type of traction.

The case of another innovation in our service--the introduction of heavy containers transported on flat cars--is similar. This year we should already leave the experimental stage and start a normal operation of containers, which requires the completion in time of the necessary investments (electric gantries, container fields) and a proper organization of all the work connected with the transportation of loads in containers of this type.

Careful handling of shipments and punctual and safe transportation should accompany all our undertakings in the execution of the haulage tasks. Although last year payments for damages did not increase, there was an increase in claims, and mostly because of unpunctual transportation. Damages paid to customers amounted to tens of millions of zlotys and constituted an important item in the costs of the railroad. This year, serious work awaits us in this connection. Just as throughout our economy here also we must with increasing energy eliminate any evils in our apparatus which are a direct or indirect cause of damage to and prolonged transportation of shipments, remembering the personal responsibility, not only to their superiors but also in the courts, of all the guilty persons, including the supervisory bodies.

The problem to which careful attention should also be given is the question of profitability of freight hauls. So far these hauls have been unprofitable to the railroad. They are to become profitable after the introduction of new freight rates. Numerous examples collected at many stations show, however, that there are still many shortcomings in dispatch work as a result of which too low freight rates are calculated and collected from senders. In many cases it was found that supplementary charges and agreed upon penalties were not collected.

The removal of these shortcomings through intensified training, increased supervision, and penal sanctions, including the dismissal of incorrigibles, is one more important duty of our service.

Employment, Costs, and Labor Productivity

The formation of costs and labor productivity in the haulage service last year is to be evaluated positively. This results from overfulfilling the plan of hauls while simultaneously keeping the costs below plan (Table 8).

Table 8

Costs and Labor Productivity in the Haulage Service

Year and Quarter	Work in terms of Million ton-Kilometers	Employment	Wage Fund	Total Costs in 1,000 Zlotys	Daily Productivity per Employee in Ton-Kilometers
First-third quarter 1959					
Plan	71,435	135,026	1,798,995	2,312,238	1,938
Execution	72,367	132.000	1,778,200	2,295,559	2,081
Percent of execution	101.3	97.8	98.8	99.3	107.4

However, the positive evaluation of the execution of tasks concerning costs and productivity should not cover certain negative phenomena in our activities on the discussed sector. Before we pass to them it is necessary to say a few words about the partial reform of wages conducted on 1 August 1959.

It included, apart from lowering the salary tax for all employees, an increase in wages for certain categories of employees on posts paid too low in comparison with the input of labor. The above-mentioned regulation of wages eliminated some of the most glaring wage disproportions in the service and made the payment of premiums dependent on the results in haulage work. The still remaining wage disproportions could not and cannot for the time being be removed becuase of the national wage situation, which does not permit any further increases in the wage fund without threatening the real value of existing wages.

The wage reform, which gave the employees of the haulage service tens of millions of zlotys per year, created conditions for a further increase in labor productivity.

Passing to tasks resulting from the analysis of employment and wages last year, it is necessary to state that our weak side continues to be the management of conductor teams in freight traffic. The ratio of the duration of travel to the total time used for auxiliary work continues to be disadvantageous. This is mostly a result of the above-mentioned unplanned travel of freight trains, though the [poor] disposition of teams and insufficient intervention of supervisory bodies are also at fault. Hence the planned outlays for overtime work of conductor teams have seriously been exceeded.

A situation of this kind must be changed because of the tasks which we have to execute this year and the means which we have at our disposal. Our targets in terms of ton kilometers in comparison with 1959 are 3 percent greater, while the employment plan will increase by only 0.5 percent and outlays for overtime hours cannot exceed a half of the sum spent last year. For this reason, without basic moves in employment management we will not keep within the framework of our resources.

The next task, stemming from the experiences of last year, is the observance of rigid discipline in confirming premiums. I stress this obvious problem in order to call the attention of the individual service superiors to the fact that toleration of any shortcomings in premium payments may have serious consequences, including criminal responsibility.

Without dealing in detail with the complex problems of employment and wages, it must be stated generally that recently these problems have become very acute and that maximum attention and interest must be devoted to them if we do not want to be in collision with the very rigorous rules in this field.

* * *

The year 1960 will be a period of very intensive and difficult work for the haulage service. The shortage of carrying capacity with relation to the needs of the national economy will not decrease but will rather--as concerns open rolling stock--become more acute. At the same time the resolutions of the Party and the government call for execution of our increased haulage targets by comparatively smaller means.

We all understand that the rapid development of our country and improved welfare of the society depend first of all on a rapid rise in labor productivity. For this reason we will make every effort to execute our haulage targets in the best quantitative and qualitative way, and at the same time with the lowest costs.

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POLAND

Railroad Freight and Passenger Targets for 1960

[This is a translation of an article by K. Blotko in Przeglad Kolejowy-Przewozowy, Vol XI, No 12, December 1959, Warsaw, pages 298-300, CSO: 3747-N/a]

We end the year 1959 with considerable achievements in freight hauls. According to a preliminary evaluation, the transportation plan for all shipments will be overfulfilled by about 6 million tons. This is probably the highest over-fulfillment of the plan of hauls in the postwar years.

The railroad had particularly difficult tasts to execute in the first quarter. The increase in hauls in that period was a consequence of general economic activity in the country caused by numerous productive pledges in connection with the Third Congress of the PZPR [Polska Zjednoczona Partia Robotnicza; Polish United Workers' Party]. Thanks to this, larger quantities of shipments than usual were dispatched in that period.

Generally the weather conditions were also favorable, which made possible a large increase in the extraction of aggregates, the exploitation of stone, and the transport of lumber to loading points.

It is no wonder that therailroad had fully to employ the rolling stock of freight cars, which in corresponding periods of other years was mostly kept in reserve.

In exploiting the objective possibilties, the railroad imposed on the contracting parties a pace of work that entailed the liquidation of stocks remaining in warehouses, particularly stocks of stone, flax straw, ore, and lumber. In effect the reserves of these materials were mostly liquidated. It was to be expected that the liquidation of reserves would contribute to an easing of transportation peaks in the third and fourth quarters, but, contrary to this expectation, this year's peaks emerged with a still greater acuteness than in the past years. This means that transport is progressively growing, which fact is undoubtedly an important one in determining a correct plan for next year.

The mass of products supplied for transportaion by the economic ministries in the fourth quarter of this year exceeded the loading capacity of the rialorad by several million tons. It is necessary to expect that a large quantity of products not accepted for transportation this year will be transferred to the first quarter of next year.

Haulage Needs and Planned Hauls

The needs of the national economy for 1960 in the field of railroad transportation are about 4.5 percent higher than the expected execution this year. This is evident from the reports of the economic ministries placed at the Ministry of Transport (Ministerstwo Komunikacji). On the basis of these reports and the experience of this year, it was determined that in 1960 the railroad will have to transport a total of about 260 million tons. This is a task within the range of the maximum transport possibilities of the railroad and its execution depends on certain conditions concerning both the shippers and the railroad.

One of the basic conditions for the implementation of the haulage plan is a uniform distribution of the the tasks over the individual quarters [of the year].

It is generally known that even with the best intentions on the part of the shippers and the railroad we will not avoid certain transportation peaks in the autumn period. In the past years these peaks were rather high. For example, it can be said that in the last few years the transportation peaks of October with relation to the average month of the year were as follows (in percent)

1956	118.9
1957	114.8
1958	115.5
1959	111.0

The above percentage peaks would be slightly higher if the carrying capacity of the railroad permitted it. Unfortunately, because of the limited capacity almost every year the railroad is forced to deliberately limit transportation peaks, often in an administrative way. The railroad simply refuses to tranport in the fourth quarter a certain quantity of products which can be carried in other quarters. The priority for the haulage of agricultural produce, beets, potatoes, grain, etc., is retained. Attention is also concentrated in this period on the maintenance of continuous work of the mines to prevent the necessity of storing the extracted coal, which would be very harmful to the general economy. Taking full account of the specific conditions of the autumn period, a transportation peak of about 115 percent was accepted in the plan for 1960. This means that in the fourth quarter of next year the hauls will be much higher than this year.

To preserve the planned proportion, the railroad will accept for transportation in the first quarter of next year about 2 million tons of products more than in the first quarter of this year. A similar increase in hauls is to take place in the second quarter.

It is to be expected that the increase in hauls in the first two quarters will involve mostly bulk products, such as coal, aggregates, and lumber. Thus it is evident that the main burden of loading work in that period will rest on those administrations whose basic task is the loading of these products--thus mostly the Katowice, Wroclaw, Krakow, and Olsztyn administrations. Other administrations which will receive these products should expect an increase in unloading work.

A certain change in the structure of products to the advantage of heavy products will make it possible to attain a better average static load per car than last year, assuming proper utilization of the loading capacity of cars. The plan assumes an increase of 0.15 tons in the index of average loading of cars.

It follows from the volume of the planned mass of products and static loading that during next year a 3.4-percent increase in laoding of cars on the PKP [Polskie Koleje Panstwowe; Polish State Railroads] network will take place.

The Rolling Stock of Freight Cars

The planned deliveries of freight cars for the railroad in the past years were always too low compared to the needs. In practice, even these low plans failed for several years to be fully realized; hence there was a considerable disproportion between the volume of hauls and the rolling stock of freight cars.

In 1959 the deliveries of freight cars were according to plan. Thus, it is to be expected that this situation will improve further.

During 1960 the railroad will receive about 9,000 freight cars and in addition other ministries will purchase about 1,000 cars which will work on the PKP network. The greatest improvement will take placein the stock of box cars, the shortage of which is felt most acutely by the railroad.

Simultaneously, 4,500 cars of old types will be scraped. As a result of these changes, the freight car rolling stock will be rejuvenated and its average technical state will be improved, especially since the majority of the purchased cars will have roller bearings and strengthened joints.

The average capacity per car will increase by 220 kilograms, which will give a better static load. In order to obtain the planned static load, it will be necessary to utilize the average capacity of cars at least to 86 percent.

The balance of loading capacity planned for October 1960, that is, the month of peak hauls, amounts to a shortage of about 3,500 cars, in connection with which the railroad will be forced to continue to obtain car help from foreign railroad administrations.

Technical and Economic Indices

The attainment of the planned haulage capacity depends on the improvement in technical and economic indices called for in the plan.

As is evident from the table below, in comparison with 1958 we will attain a certain improvement in the basic indices in 1959, particularly those of turnover of cars, average static loading of car, and utilization of the train with respect to the weight and number of axles.

Table 1

Index	1958 Execution	Expected 1959 Execution	Draft Plan for 1960	Percent 1960:1959
Coefficient of car turnover, days	5.06	5.02	4.90	97.6
Static loading of car, tons	18.74	19.00	19.15	100.8
Average gross weight of train, tons	1,037	1,045	1,049	100.4
Average net weight of train, tons	563	568	572	100.7
Ratio of gross to net weight	0.543	0.544	0.545	-
Average number of axles in train	93.2	94.1	94.2	100.1
Average commercial speed of trains in kilometers per hour	17.49	17.12	17.90	104.6

A disquieting phenomenon is the deterioration, in comparison with last year, of the commercial speed of freight trains. Although a certain percentage of this drop may be due to imperfect reporting last year, the basic cause lies in the irregularity of the runs of trains.

The targets for 1960 assume a further improvement in indices.

The possibilities for thier attainment are realistic if we take into account the new technical resources which the railroad will receive next year. Further improvement depends on improved organization of labor.

An important factor which should operate to improve results is the further development of electrification.

After new sectors of electrified lines are opened for operation, the structure of freight traffic expressed in gross ton-kilometers will change in such a way that the share of electric traction will increase considerably at the expense of steam traction, as is illustrated in Table 2.

Table 2

Structure of Traction of Freight Traffic in Percent

Traction	1958	Expected 1959 Execution	1960 Plan
Steam	97.3	96.4	92.4
Electric	2.7	3.6	7.6
Total	100.0	100.0	100.0

In connection with the expansion of the scope of work of electric traction, a considerable improvement in the commercial speed of freight trains and a certain increase in their weight can be expected.

To facilitate the work of collective trains, combustion traction will be introduced for this type of trains. It is expected that the railroad will be supplied with several combustion locomotives of 150 horsepower, which will be used in switching work in collective trains at intermediate stations. Thanks to the work of these locomotives, the engine of the collective train will be relieved of switching work at intermediate stations and this will increase the commercial speed of these trains. In addition, a certain number of combustion locomotives of 300 and 350 horsepower will be directed to switching work at junctions and major stations.

As a result of the widening scope of railroad modernization, it is expected that there will be an improvement in the technical and economic indices and therefore an increase in the hauling capacity of the railroad.

Apart from technical measures, an equally important part is played by organizational improvements, Labor organization is still an abundant source of reserve hauling capacity. An example is found in the turnover of cars. From year to year the transport service faces the task of shortening the turnover of cars and for several years we have been observing a systematic improvement in this index, although the tendency toward improvement constantly diminishes. Malicious persons sometimes ask when we will attain the coefficient of turnover equal to zero. Ignoring the absurdity of the very question, we should consider the sense and possibilities of further cutting the turnover of cars. In the next few years we should take into account the necessity of cutting the turnover of cars by at least half a day. If we do not achieve this, deliveries of rolling stock will be of no avail because the increased numbers deprived of the possibility of fast rotation will burden the rialroad stations and will become an obstacle to the work. Thus, speeding up the turnover of cars is essential.

Of course, a radical change with regard to the present possibilities of cutting the turnover of cars can take place only as a result of certain radical organizational moves.

One of the undertakings designed to cut the average stopover time of cars at a stations, and thus cut the turnover of cars, is the work initiated this year for wide utilization of the second half of the working day for loading activities and the application in this of the principle of loading cars unloaded in the same station. This is not an isolated action but a system which should constitute the permanent principle of loading work. Of course, the effects of this system will be evident after the resistance of the customers of the railroad is overcome. The objective will not be attained by administrative measures alone; it is necessary to consistently influence the shippers at the railroad stations.

Following the introduction of the system of two-shift loading work must come efficient car dispostion, undisturbed service of loading points, and properly organized early advice on forthecoming shipments.

With regard to the average weight of a freight train, no great improvement is expected next year because this could adversely influence the commercial speed of trains and therefore the carrying capacity of the line. But this does not mean that there are no more reserves as concerns the weight of the train or that all trains are properly utilized with regard to the weight fixed in the timetable. The plan for 1960 assumes an increase of 4 tons in the average gross weight of a freight train over this year, while in 1958-1959 the increase was 8 tons.

In implementing the tragets concerning the average weight of trains, one should not, in principle, count on increasing the length of the train but mostly on increasing the average load of cars and making a certain improvement in the ratio of empty to loaded axles.

Passenger Hauls

In preparing the plan for passenger hauls, the principle of improving the comfort of travel was taken into account. For this purpose the number of trains and their work expressed in train-kilometers will increase despite the fact that after new passenger fares are introduced an increase in the number of travelers should not be expected. In this way the average of 10.9 persons per axle of passenger car will be attained, which constitutes an improvement of 0.5 persons per axle in comparison with this year.

To improve travel conditions, 380 passenger cars, including 80 two-level ones and 20 dining cars will be purchased. In addition, the purchase plan contains 27 electric three-car units and 50 combustion motor cars.

At the same time, cars of the old type will be withdrawn, which will improve the average technical state of the passenger car rolling stock.

The structure of participation of individual types of traction will be changed in that the share of steam traction will be decreased in favor of fast and comfortable motor and electric traction. The percentual share of train-kilometers in individual types of traction in the total runs of passenger trains is presented in Table 3.

Table 3

Structure of Traction in Passenger Traffic in Percent

Type of Traction	Hauls Executed in 1959	Plan for 1960
Steam	83.3	80.4
Electric	13.2	13.7
Combustion	3.5	5.9
Total	100.0	100.0

* * *

The briefly discussed basic targets for 1960 are based on expectations of a considerable increase in freight hauls and stabilization or even a drop in passenger hauls. This forces us to call particular attention next year to improving freight traffic and to look for new ways of increasing the carrying capacity in that type of traffic. The targets are ambitious but possible to execute.

POLAND

Technicla Data on Public Utility Power Plants of Over 40 Megawatts

[This is a translation of an article by Jakob Mandel in Przeglad Elektrotechniczny Vol XXXV, No 11, November 1959, Warsaw, pages 442-451; CSO: 3754-N]

Subject, Growth of the basic power facilities during the 1949-1959 decade. Coal loading methods and fuel reserves in the case of bituminous and brown coals. Technical features of presently used boilers and steam turbines, as well as heat circulation auxiliary devices. Water economy in electric power plants. Modern arrangement and design of the main building for a steam-electric power plant. Basic technical and economic indices achieved in the construction of electric power plants during the past decade.

1. Introduction

The present article offers a synthetic presentation of the development of the technical concept in the determination of fundamental engineerying designs in planning public utility electric power plants in Poland. The study is based on the ten-year period of activities conducted by the "Energoprojekt" Power Engineering Office, which celebrates its tenth anniversary on 1 October 1959.

In addition to industrial electric power plants, which are subject to separate consideration, and projects concerned with the expansion of public utility power plants of below 40 megawatts, the "Electroprojekt" developed during the 1949-1959 decade 28 projects of a total capacity of 6,091 megawatts, ranging from 44 to 1,200 megawatts.

The respective electric power plant construction stages, which differ in their engineering solutions, are considered separate projects; their total number is 28 and they are applies to 24 electric power plants. Basically, only projects developed by "Energoprojekt" without cooperation from abroad are considered; however, for the sake of a more complete presentation of the technical development, the Jarzowo II Electric Power Plant, which was planned by the Leningrad Section of "Cieploelektrojrojekt" without the participation of "Energoproject," has also been taken into consideration. The expansion of the Chorzow Electric Power Plant has been omitted from the list because of the difficulties which arose in connection with the separation of the expansion project from the existing operating facilities. Completed projects as well as those under construction have been taken into consideration; projects whose preliminary plans have been approved up to 1959 are also included. The electric power plant in Pulawy and the expansion of the Laziska and Chorzow Electric Power Plants have not been considered in view of the insufficient crystallization of their preliminary plans.

2. General Data

In Table 1 the number and capacity of the electric power plants has been compiled according to the character of investment or type of power plant and divided into two ten-year periods according to the date of approval of the preliminary plans.

The share of restored projects, which had been destroyed during the war but still had a number of buildings of considerable value, amounted to 25 percent in the first five-year period, and only 11 percent in the second one. Of these arrears, only the second stage of the Pomorzany Electric Power Plant remains to be completed. The share of projects planned in cooperation with foreign firms, which in the first five-year period amounted to 47 percent, dropped during the second five-year period to 18.5 percent. The capacity of the largest planned power plant, which in the first five-year period amounted to 300 megawatts, increased fourfold, attaining 1,200 megawatts.

The state of realization of the above projects follows. Data as of 1 July 1959 (in megawatts):

15 projects have been put into operation, total capacity	2,171
Construction in very advanced stage, partly put into operation, six projects, total capacity	810

Construction started, engineering plans completed, two projects, total capacity	460
Contractor has entered construction site, engineering plans in development on three projects, total capacity	1,900
Engineering plans not started on two projects, total capacity	750
Total--28 projects, total capacity	6,091

Table 1

General Features of Public Utility Power Plants of Over 40 Megawatts, as Planned by "Energoprojekt" and Approved for Construction in 1949-1959

Type of work Performed	Total		1949-1954		1955-1959	
	A	B	A	B	A	B
Total	28	6,091	15	2,101	13	3,990
Type of construction						
Restoration	7	935	4	455	3	480
New construction	13	4,133	6	1,223	7	2,910
Expansion	8	1,023	5	423	3	600
Type of electric power plant						
Steam condensing electric power plants	25	5,461	13	1,721	11	3,740
Thermal power plants	3	630	2	380	2	250
Ways of planning						
Independent projects	20	4,356	11	1,106	9	3,250
Planned in cooperation with abroad	8	1,735	4	995	4	740

A = Number of projects
B = Total capacity in Megawatts

3. Steam Parameters

The steam parameters adopted in the above considered projects--28 in all--can be divided into five groups whose characteristics are shown in Table 2.

Table 2

Steam Parameters of Public Uitlity Power Plants of Over 40 Megawatts, as Planned by "Energoproject" and Approved for Construction in 1949-1959

Group	Steam Pressure Before Turbine (Centigrade)	Primary Steam Temperature before Turbine (Centigrade)	Secondary Steam Temperature Before Turbine (Centigrade)
I	36	430-435	-
II	56-70	485-490	-
III	90-96	500-535	-
IV	127-130	535-540	535-540
V	141-181	525-540	525

[Table 2 continued]

Group	Unit Capacity of Turbo-Generators Steam Condensation, Megawatts	Thermal Megawatts	Number of Projects	Capacity of Projects Megawatts	Percent	Approval of Preliminary Plans (Years)
I	25	12	3	195	3.2	1950-1952
II	35.55	-	8	926	15.2	1948-1953
III	50.55.100	25.30	10	2,000	32.8	1949-1958
IV	125.130.200	-	5	2,700	45.5	1959-1959
V	60.70	-	2	260	4.3	1956
Total			28	6,091	100.0	

The steam parameters 36 atmospheres, 435 degrees Centigrade (Group I) did not play any significant role in public utility power engineering. The postwar restoration and expansion of public utility power plants was based on the 56 to 70 atmospheres, 485 to 490 degrees centigrade (Group II) steam parameters, introduced by the Germans during the occupation. All of the equipment was imported, mostly from Czechoslovakia.

The next step was the transition to Soviet parameters 90 atmospheres, 500 degrees centigrade (GroupIII). After a time, the superheat temperature was raised to 535 degrees centigrade, which increased the efficiency by about one percent. In the beginning, the equipment for this parameter group was imported from the Soviet Union, several units from Austria and West Germany (95 atmospheres, 510 degrees centigrade); later, however, domestically produced boilers and type TC-25 turbogenerator sets were introduced and installed. Soon domestically produced steam condensing units of the above parameters and 50-megawatts capacity will be put into operation.

About 50 percent of the electric power plants planned during the 1949-1959 period were planned for steam parameters of Groups I to III, without interbank superheating. Beginning in 1958, these parameters ceased to be of interest for the expansion of public utility power projects.

The steam parameters 127-130 atmospheres, 535-540 degrees centigrade, with 535-540 degrees centigrade secondary superheating (Group IV) have been adopted as fundamental parameters for the further development of power engineering in the present stage. A part of the equipment is being imported; however, the domestic production of 125-megawatt turbogenerator sets, 127 atmospheres 535/535 degrees centigrade, and corresponding boilers has already been undertaken. The above parameters correspond to the present world engineering standards and are economically justifiable. Economic considerations have shown that it is inexpedient to raise the steam temperature from 535 to 565 degrres centigrade, in view of the fact that the end sections of the steam superheaters would have to be made of costly austenite, and also because of the price increase of steam pipe. The considerations on the use of high-quality Marvedur F-11 (11.5 to 12.5 percent Cr,).9 to 1.2 percent Mo) ferrite steel, recently introduced from West Germany, which could be used for the manufacture of end sections for steam superheateers and pipes, also failed to give positive results, because the steel in question has not been sufficiently tested.

Group V steam parameters (141-181 atmospheres, 525-540/525 degrees centigrade) is of transient character; it is connected with immediate orders of equpment from West Germany and is not expected to find wide application.

4. Fuel

From entry 10 of Table 8 it results that new electric power plants are being planned for ever poorer fuels. The share of electric power plants designed for fuels of heating value of 4,000 to 5,000 kilocalories per kilogram dropped from 87 percent (with respect to capacity) in the first five-year period to less than 25 percent in the second. On the other hand, the share of electric power plants operating on brown coal increased from 8 to 53 percent.

5. Supply of Bituminous Coal to Electric Power Plants

The supply of coal to electric power plants designed during the above decade is secured by means of railroad.

Type Wdd railroad cars are unloaded with the aid of coal tipplers. Where drop-bottom cars are used, they are unloaded either on coaling trestles or into coal bins. At present, however, drop-bottom cars are considered inadequate for electric power plant operation purposes.

The size of the coal yard depends on the specific fuel reserves, which for the Southern District ranges from 10 to 12 days; for the Central District, 14 to 28 days; for the Lower Silesian District, 20 to 45 days; and for the Western District, 54 to 100 days. The height of the storage pile ranges from 4 to 9 meters, and most frequently amounts to 6 to 8 meters. The coal is fed into boiler bunkers with the aid of belt conveyors.

The capacity of the boiler coal bunkers is calculated, in the case of single-track belt conveyors, for a 16- to 26-hour peak load of the boiler house, and in newly planned projects for a 20-hour period. The capacity of boiler bunkers on new projects, where double-track belt conveyors are employed, can be reduced to 6 to 20 hours, and for 375 tons per hour boilers to 14 hours.

6. Supply of Brown Coal to Electric Power Plants

The brown coal to three electric power plants operating on that coal, total capacity, 1,065 megawatts, is supplied by means of mining type drop-bottom cars, and to one electric power plant of 1,200 megawatts capacity, with the aid of belt conveyors.

The unloading in two of the above plants is carried out by dumping the coal into coal bunkers; in the other two plants with the aid of trestles served by wheel excavators.

Trough bunkers have not so far been used in Polish power engineering installations.

The size of the brown coal yards in electric power plants is planned for 12- to 24-hour periods of plant operation at peak boiler loads and lowest heat value of the coal. Past operating experience has failed to provide a view as to the necessary reserve of coal to be held by electric power plants. It should be added that the reserve depends to a large extent on the work performed on holidays at open-cut mines, and on the efficiency of open-cut mine facilities.

As a rule, the coal is fed into boiler bunkers with the aid of belt conveyors. The capacity of these bunkers (in hours of boiler peak output) is as follows:

For boiler outputs of 130 tons per hour	16
For boiler outputs of 230 tons per hour	10
For boiler outputs of 375 to 650 tons per hour	6 to 8

The crushing of the coal is generally carried out between the storage area and the boiler house. The latest projects provide for the separation of lignite coals--whose content in the coals of the Kominski District amounts to about 8 percent--with the purpose of utilizing them as raw material for the production of cardboard and charcoal.

7. Coal Pulverization

The types of coal pulverisers and milling cycles planned for the projects of the considered ten-year period are presented in Table 3.

Table 3

Characteristics of Coal Pulverizers for Public Utility Power Plants of Over 40 Megawatts, as Planned by "Energo-projekt" and Approved for Construction in 1949 - 1959

Group	Type of Pulverizer	Unit Output of Pulverizer (tons per Hour)	Number of Pulverizers per Boiler
	A. Pulverizers for bituminous coal		
I	Central mills with drun-ball pulverizers	22-33	-
II	Drun-ball pulverizers with bunkers for slack coal	10-25	2
III	Beat pulverizers	5-8	3
IV	Fan-type pulverizers	7.5-12	3
V	Crushing mills	6-18.5	3-6
	B. Brown coal pulverizers		
VI	Fan-type pulverizers	17-45	4-8

[Table 3 continued]

Group	Unit Output of Boilers (tons per hour)	Number of Boilers	Total Boiler Output Tons per hour	Total Boiler Output Percent	Approval of Preliminary Plans (years)
I	90-130	14	1,650	9.2	1949-1950
II	130-230	45	8,670	48.1	1949-1957
III	79-130	10	1,027	5.7	1951-1952
IV	120-130	11	1,370	7.6	1953-1955
V	120-403	24	5,312	29.4	1955-1958
Total		104	18,029	100.0	
VI	130-650	21	7,650		1952-1959
Total		125	25,679		

Central grinding mills have been constructed at restored projects, which already possessed this type of mills before.

Drum-ball pulverizers with transient bunkers for pulverized coal have been in most frequent use during the past decade. Only very recently did drum-ball pulverizers begin to give way to pulverizing mills (medium speed), which are considerably lower in cost and consume less electric power. At present, pulverizing mills for bituminous coal are being used whose grinding capacity exceeds 45 degrees Hardgrove. Drum-ball pulverizers may be used for excessively hard coals only.

Beater and ventilator pulverizers are of little importance for bituminous coals; however, ventilator pulverizers have been and still are used for brown coals.

The drying of bituminous and brown coals is carried out in the pulverizer proper with the aid of hot air or exhaust fumes. Separate driers are planned for coal mines only.

8. Boilers

During the first postwar period, power engineering constuction projects were based on boilers of 80- to 130-ton per hour capacities, imposed by the size of the existing buildings, the capacity of the expanding electric power plants, and the design limits of the manufactureers. These boiler units appeared in the projects up to 1955. Beginning in 1949, Soviet-made boilers of 230-ton per hour capacities appeared simultaneously on the projects. The latter were replaced in 1958 by 375 to 400 ton per hour boilers, which are expected to play a basic role in the future development of power engineering.

The largest boilers, planned for the Turow Electric Power Plant, are brown coal operated boilers of 650-tons per hour capacity.

With the exception of several La Mont type boilers purchased in Sweden, and several Benson type boilers purchased in Austria and West Germany, all the remaining boilers operate on natural circulation. Similarly, with the exception of seven boilers with fluid slag removal, all the remaining have granulating stokers. The presently attained boiler efficiencies are as follows:

	Boiler efficiency in Tons Per Hour		
	210-230	375	650
For brown coals	0.86	0.875	0.875
For bituminous coals	0.88-0.89	0.90	-

9. Feed Pumps

The characteristics of feed pumps considered for the above projects are presented in Table 4, from which a variety of views as to the selection of feed pumps developed. At present, steam drives are no longer applied to feed pumps, in view of the dependability attained with two independent electric supply sources. The application of variable-speed electric pumps, in which the speed is varied with the aid of hydraulic couplings, is economical.

The application of two pumps of an output designed to carry 100 percent of the demand, for the supply of 375-tons per hour boilers operating in combination with 125-megawatt turbine sets, proved more economical than that of three pumps, each of an output of 50 percent of the demand. On the other hand, large 200-megawatt blocks with boilers of 650-tons per hour capacity are provided with three feed pumps, each with an output corresponding to 50 percent of the rated water demand.

Table 4

Characteristics of Feed Pumps for Public Utility Power Plants of over 40 Megawatts, as Planned by "Energoprojekt" and Approved for Construction in 1949-1959

Group	Maximum Continuous Unit Output of Boiler(tons per hour)	Number of Boilers	Total Boiler Output (tons per hour)	Number of Feed Pumps Total	Steam Driven
I	79-130	8,127	82	24	-
II	206-237	9,026	60	9	6
III	308-385	3,820	20	-	12
IV	403	806	6	-	6
V	650	3,900	18	-	18
Total		25,679	186	33	42

[Table 4 continued]

Group	Number of Feed Pumps Electric Driven With Speed Regulation	Output of Feed Pumps Unit (Tons per Hour)	Total (Tons per Hour)	Average Number of Pumps to Number of Boilers	Average Pump Output to Boiler Output
I	-	135-320	18,145	1.23	2.23
II	6	225-270	15,000	1.50	1.66
III	12	400-410	8,080	2.00	2.12
IV	6	240	1,440	3.00	1.77
V	18	360	6,480	3.00	1.66
Total	42		49,145	1.49	1.91

10. Additional Water for Boiler Circulation

From item 23 of Table 8 it results that initially chemical softening and evaporators were most frequently used for obtaining additional water for feed circulation. Evaporators were relinquished in four [sic] cases; in electric power plants equipped with low-pressure boilers fed by softened water, high-pressure boilers fed by condensation water from low-pressure turbines; or in electric power plants having boilers with multi-stage steam evaporation and flushing.

Demineralization of raw water is being applied to an ever increasing extent for boilers whose operating pressure exceeds 100 atmospheres, whereby this is a rule for thermal-electric power plants with technological receivers [presumably steam outlets for technological processes] (large condensation water losses) and for boilers with pressures on the order of 150 atmospheres. In exceptional cases, where the raw water contains too much salt, the operating costs of a demineralization apparatus might prove too high.

11. Exhaust Fume Collectors and Chimneys

Electrostatic filters of a 0.9 to 0.97 efficiency are foreseen for exhaust fume collection in the above projects, depending on the local requirements and the degree of pollution of the specific region. One electric power plant (Jarzowo II) of 300-megawatt capacity, which is provided with multicyclones of 0.7 efficiency, constitutes an exception.

In two cases, in two local thermal power plants (Bielsk, Siekierki), combination collectors consisting of a multicyclone and Cottrell filter, in cascade connection and of an 0.97 efficiency were used, while in another case (Pomorzany) an additional multicyclone was applied after the Cottrell filter.

Of the 28 considered projects, in only seven cases are the filters placed within the building; as a rule they are installed in open air.

The number of boilers per chimney varies from one to six, depending on local conditions, especially in reconstructed or developed areas.

Cost comparisons, which include chimneys as well as breeches and a number of other factors, do not justify the connection of more than two 375-ton per hour boilers to one chimney. The height of recently planned chimneys for large electric power plants attains 150 to 160 meters, which results everytime from the calculated sulfurization of the terrain.

12. Removal of Slag and Ashes

The slag and ash removal systems used in the projects are shown in Table 5.

Table 5

Characteristics of Slag and Ash Collecting Equipment for Public Utility Power Plants, as Planned by "Energoprojekt" and Approved for Construction in 1949-1959

Group System	Removal of Slag from Boiler		Removal of Slag from Boiler and Cottrell Filter		Transportation of Ashes to Place of Deposit	
	A	B	A	B	A	B
I Hydraulic	19	4,364	14	2,414	14	2,633
II Mechanical	5	731	-	-	7	2,150
III Pneumatic with pressure	-	-	7	2,208	7	1,308
IV Pneumatic with suction	2	370	4	469	-	-
V Combination	2	626	3	1,000	-	-
Total	28	6,091	28	6,091	28	6,091

A = Number of projects
B = Total capacity of all projects in megawatts

For safety and hygiene reasons hydraulic removal of slag and ashes is most frequently recommeded. In view of the strong alkalinity of water polluting ponds and rivers, wet slag deposits have been abandoned in the case of brown coal.

13. Turbo-generator Sets and Thermal Diagram

The characteristic data of turbo-generators, already in operation or still in design, as well as the basic data on thermal diagrams, are presented in Table 8 (the parameters discussed in Section 3 are not included).

The projects in the initial period of the considered decade were based on 35- to 55-megawatt turbo-generator sets. Only as late as in 1954 was the decision reached to install 100-megawatt turbo-generators of Soviet production at the Skawina Electric Power Plant, and in 1958 the first projects based on 125-megawatt, 127-atmospheres, 538/538 degrees centigrade turbo-generators, foreseen as the fundamental power generating units for the nearest future, were approved.

The largest turbo-generator set approved in 1958 is the type PVK-200-1 turbo-generator of Soviet make, installed at the Turow Electric Power Plant. Its characteristics are: capacity, 200 megawatts, steam parameters, 130 atmospheres, 535/535 degrees centigrade.

High degassing temperature (205 degrees centigrade--that is, the placing of the feed pumps with all preheaters--was applied in the case of six turbo-generators only, at the Miechowice and Stalowa Wola II electric power plants owing to the high degree of unreliability of high-pressure preheaters. In the case of the remaining turbo-generators, the degassing temperature maintained at a constant level amounts to 135 to 162 degrees centigrade. Domestic turbo-generators of 125-megawatt capacity have a degassing temperature varying between 105 and 119 degrees centigrade, a duplex feed pump consisting of an auxiliary pump inserted after the feedwater tank, and a main pump with all the preheaters.

Figure 1 [not reproduced] presents the most characteristic turbine connection diagram--that of a 125-megawatt turbine of domestic production. At the beginning, as a rule, distribution steam and feedwater conduits were used; sometimes an auxiliary boiler was also foressen. Beginning in 1955, the power industry definitely switched to pure single-block systems.

In order to maintain the vacuum in the condensers, steam ejectors were most frequently applied; later projects, based on deliveries from West Germany, plan the usage of water ejectors, while electric power plants with 125- to 130-megawatt turbo-generator sets foresee the use of vacuum pumps.

14. Cooling Water

Cooling method for turbine condensers:

Type of Circulation	Number of Projects	Total Capacity	Percent
Closed with chimney cooler	17	4,421	72.7
Open with water supply from river	6	745	12.2
Open with coolers for the summer season	2	500	8.2
Open from the condensers of the old turbines*	1	110	1.7
Cooling in a pond	2	315	5.2
Total	28	6,091	100.0

*Turbines designed for circulation cooling (27 degrees) obtain water from the old turbines cooled by river water.

Chimney coolers used to be manufactured of steel. Since 1953 they have been made almost exclusively of hyperboloid ferro-concrete. Drenchers are presently made of eternite plates. The cooler capacity is as follows (in cubic meters per hour):

For 50-megawatt blocks	10,000
For 125-megawatt blocks	17,000
For 200-megawatt blocks	27,000

In ofrmer projects the cooling range [or zone] was predominently 37/27 degrees centigrade. Only in the past few years have economic claculations shown the expediency of a 33/24 degrees centigrade cooling zone. The period of economic expediency in electric power plants operating on bituminous or brown coal amounts--at a cost of 300 zlotys per ton of conventional coal--to five to six years. Therefore, in the past few years all the projects based on 125-megawatt turbo-generator sets have been using the 33/24 degrees centigrade cooling zone.

The pre-evaopration methods of auxiliary water for the cooling circulation result from the following schedule:

Method of Pre-evaporation	Number of Projects	Total Capacity (in megawatts)
Inoculation with hydrochloric acid	3	241
Inoculation with sulfuric acid	2	1,400
Decarbonization	4	785
Decarbonization and inoculation with acid	7	1,560
Natrium exchangers	1	500
Not finally determined yet	1	250

15. Thermal Measurements

The placement of measuring devices results from the following schedule:

	Number of Projects	Total Capacity in Megawatts	Percent	Approval of Preliminary Plans
Individual panels at boilers and other equipment	14	1,915	31.5	1948-1955
Centralized non-block panel-board	6	946	15.5	1948-1956
Centralized block panel-board	8	3,230	53.0	1956-1959
Total	28	6,091	100.0	

At present, centralized panel-boards are planned for steam condensing electric power plants. These panel-boards consist of two blocks, from where all the basic equipment connected to the block is controlled.

The following control equipment is expected to be installed for the 125 boilers, which cover the above considered projects:

Equipment	Number of Boilers
Automatic hydraulic	14
Automatic Pneumatic	15
Automatic hydraulic and electric	9
Automatic pneumatic and electric	12
Automatic electric	21
Automatic electronic	21
Total	54
	125

The diversity of equipment types unfavorable for operating purposes, which originate from various firms, resulted from the imposed import situation, as well as from the failure to develop a policy to face that problem.

16. Composition of Main Building

The composition of the main buildings is characterized by: a) type of construction (low or high); b) disposition of turbo-generator sets (longitudinal or lateral); c) mounting of boilers (single or double row); d) location of coal bunkers; e) location of feedwater tanks; f) construction of boiler room; g) location of auxiliary facilities.

a) The construction presently used in Poland is, as a rule of the flat type and consists in that the Cottrell filters and mechanical draft fans are carried outside the boiler room and installed at ground level; the chimneys are free-standing and the supply fans at 0.0 level of boiler room. Higher structures, in which the Cottrell filters or other exhaust fume collectors are mounted behind the boiler, the draft fans and chimneys are behind the coal bunkers, and the preheaters and supply fans are high up, did not find wide application in this country, since it requires heavy structures.

b) In former projects the system of two boilers per turbo-generator set, which justified the longitudinal mounting of the turbo-generators, was predominant. Larger projects, based on "Cieploelektroprojekt" deliveries and typical designs, usually called for longitudinal arrangement of the turbo-generators. Furthermore, certain constructions were connected with the existing buildings, in which the turbo-generators could be installed only lengthwise the machine room.

Studies of the composition of the main building conducted during the past few years have shown that a lateral arrangement is more convenient in the case of monoblocks, because it provides a more compact composition of the main building and reduces its cubic content. In the projects of the past few years, this system has found exclusive application.

c) Boilers are usually mounted in one row. Only in six earlier restoration or expansion projects connected with existing buildings was the two-row system applied out of necessity.

d) The location of the coal bunkers was planned as follows: between machine and boiler rooms in 12 projects, outside the boiler room in eight projects, between two boiler rows (in a two-row boiler room), in six projects, between the boilers (in a single-row boiler room) in two projects.

The early arrangements of the coal bunkers between the machine and boiler rooms, applied, for example, at the Miechowice Electric Power Plant, the Zeran, and the Lodz II thermal power plants, formed a main building consisting of four naves: machine room, degassing gallery, bunker-gallery, and boiler room. This arrangement had the disadvantage of requiring a high external boiler wall, which was rather costly. Thus it was replaced in 1952-1954 by another arrangement in which the coal bunkers were placed behind the boiler room. In this arrangement the roof of the boiler room was supported by the degasifier gallery on one side and the coal bunkers on the other. The system was applied at the Stalowa Wola II, Skawina, and Konin I electric power plants, among others.

The cross-sections of the main building at the Konin I and II Electric Power Plants of 315-megawatt capacity are presented in Figures 1 and 2 [not reporduced].

During the past few years, free-standing boilers in boiler rooms began to be replaced by boiler constructions strictly connected with the boiler room structure. The concept of a separate degassifier gallery was given up at the same time. The above solution, which aims at investment savings, led to the modern composition of the main building with a massive bunker gallery in the middle, on which the machine room finds support on one side and the boiler room on the other. This system has been applied at the Konin II Electric Power Plant; furthermore, it found application in the latest projects for such electric power plants equipped with 125- to 130-megawatt turbo-generator sets, as in Lagisza, Siercza Wodna, and Adamow.

The boilers at the Siercza Wodna Electric Power Plant are suspended from the boiler room structure, and at the Adamow plant the upper part of the boiler block extends above the boiler room roof.

At the Turow Electric Power Plant, which contains 200-megawatt turbo-generator sets, the coal bunkers have been placed between the boilers in such a manner that each boiler has two coal bunkers, one on each side. Only this arrangement made the proper feeding of the eight pulverizers placed around the boiler possible; it also helped to adapt the levels of the turbo-generators to that of the boilers.

e) The feedwatter tanks were placed in a spearate degassifier gallery in 20 projects: in the machine room in two projects; in the boiler room in two projects; between the coal bunkers in one projects; and behind the coal bunkers in one project.

At present, no more separate degassifier galleries are planned; therefore, the feedwater tanks are installed in the machine room, boiler room, or over the coal bunkers. The most convenient arrangement is to install the feedwater tanks in the machine room below the machinist's level, provided there is a possibility of supplying feed pumps not requiring a high submersion level.

f) In the case of 22 projects the boilers are located entirely inside the building, while in threee projects a crane is mounted over the boilers. In threee newly designed projects the upper part of the boiler extends above the boiler room. No more cranes are planned over the boilers, since they raise the cost of the boiler room.

g) Plant control boards are most frequently mounted in the middle nave of the main building. Other locations are not excluded, however, should they prove more economical.

17. Design of Main Building

The method of carrying out the design of the individual elements of the main building are presented in Table 6.

Table 6

Characterisitics of the Main Building in 28 Public Utility Power Plants of over 40 Megawatts, as Planned by "Energo-projekt" and Approved for Construction in 1949-1959

Type of Construction	Boiler Room Columns	Machine Room Columns	Coal Bunker Columns
	Number of Projects		
Reinforced concrete, wet process	6	12	17
Precast reinforced concrete	2	1	1
Steel	18	14	10
Reinforced concrete and steel	2	1	-
Rod-reinforced concrete	-	-	-
Brick	-	-	-
Precast slabs	-	-	-

[Table 6 continued]

Types [same]	Coal Bunkers	Boiler Room Rafters	Machine Room Rafters	Exterior Walls
		Number of Projects		
	17	4	5	-
	1	-	-	-
	10	22	21	-
	-	-	-	-
	-	2	2	-
	-	-	-	17
	-	-	-	11

Table 7

Cubic Content Index of Main Building(Average Value) for Public Utility Power Plants of over 40 Megawatts, as Planned by "Energoprojekt" and Approved for Construction in 1949-1959

Type of Electric Power Plant	Plant Capacity (megawatt)	Unit Output of Turbo-Generator*	Unit Output of Boilers***	Main Building Cubic Content Index**
Thermal Power Plants	50	25	120	3.0
	150	25	120	2.5
Thermal poer plant according to old composition	200-240	25-30	230	2.0
Thermal power plant according to net compostion	200-240	25-30	230	1.1-1.3
Steam condensing power plants	50-100	25	100-130	1.5-1.7
	100-300	50	120-1?0	1.3-1.0
	200-300	50	215-230	1.1-1.3
	300-400	100	210-230	0.9-1.1
	500	125	380	0.65-0.8
	1,200	200	650	0.64

*Megawatts
**Cubic meters per kilowatt
***Tons per hour

Economic calculations carried out according to current prices show that it is more expedient to construct the boiler room and all the rafters of steel and the massive nave for the coal bunkers of reinforced concrete. The suspended storage hoppers should be of steel. The columns of the machine room should also be of steel, with the reservation that during periods of steel shortage they may be made of reinforced concrete. Certain designers apply a mixed construction pattern--namely, reinforced conrete to a certain height and steel above it. Precast constructions applied in two thermal power plants (Lodz II and Bielsko) did not find wide application, owing to their high cost and long construction periods. Rod-reinforced concrete rafters also failed to furnish satisfactory results. The construction of exterior brick walls has been abandoned for a number of years now. It has been replaced by large precast slab. The latest projects foresee interior walls of eternite and glass. It is worth noting that in three projects the interior wall between the boiler and machine rooms has been abandoned.

18. General Plan

An analysis of the general plan of the planned projects and the classification of its composition with respect to a number of factors, such as supply of fuel and its storage, power supply, topographic conditions, hydrogeologic conditions, wind conditions, electric power plant expansion requirements, railroad and road connections, grouping of auxiliary buildings, etc., cannot be considered within the framework of this article.

The area occupied by the electric power plants varied with the particular project. Should the excessively large areas occumpied by such projects as the Jarzowo II Electric Power Plant, capacity 300 megawatts, area 41.8 hectares be omitted, and should the electric power plants which, out of topographical considerations, had to be set up in confined conditions also be disregarded, the following average indices of the areas occupied by the electric power plants can be compiled on the basis of the developed projects:

For Electric Power Plants of:	Hectares
100 Megawatts	12 to 15
150 Megawatts	15 to 20
200 Megawatts	20 to 25
300 Megawatts	25 to 30
500 Megawatts	30 to 35
1,200 Megawatts	35 to 40

19. Technical and Economic Indices

The unit cubic content of the main building is an important factor in the location of equipment and composition of the main building, and it basically determines its cost. The above factor which results from the carried out projects is presented in a synthetic way in Table 7, and for the respective projects it can be found under item 34 of Table 8.

The plants' own power consumption, compiled according to the completed projects, as well as according to operating data for 1958 of projects handed over for operation, is presented in Table 8, items 39 and 40. It assumes different shapes and it varies for electric power plants of the same type within rather a wide range. The main reason for this is the great diversity of the auxiliary equipment imported from many different countries, and especially of pumps and fans, whose efficiency basically affects the plant's own power consumption. It is therefore impossible to establish synthetic indices with respect to the type of the basic facilities on the basis of available matefials, without a thorough analysis of the respective power consumption factors. On the basis of calculations carried out during the past few years in connection with the preliminary planning of modern electric power plants, it is only possible to arrive at the general conclusion that in plants of 500 to 1,200-megawatt capacity, operating with 125-megawatt or 200-megawatt blocks, steam parameters 127 atmospheres, 535/535 degrees centigrade, and employing modern auxiliary equipment, the power consumption should vary within the limits of 7 and 8 percent. It should be added that the lower figure pertains to bituminous coal of a heat value of 5,000 kilocalories per kilogram, and the higher one to brown coal of a heat value of about 2,000 kilocalories per kilogram.

The unit heat consumption of the turbo-generators, guaranteed under economic load conditions, is presented for the respective projects in Table 8, item 41. From these data it appears that the heat consumption indices of the turbo-generators vary for the very same steam and power parameters toa quite appreciable extent. This is due to the various efficiencies, which vary with the manufacturer. The optimum net unit heat consumption, according to guaranteed data, with the account of heat losses in the pipes and block transformer, is given in Table 8, item 42. The considerable deviation of this index at similar parameters is due to the above-mentioned reasons. The reduction of the unit heat consumption in the most modern electric power plants--as compared with the oldest ones--amounts to 26 percent. This difference not only affects the increase of the steam parameters and the application of interbank superheating but also contributes to the improvement and increase of the efficiency of basic and auxiliary equipment for a period of ten years.

The unstable unit heat consumption per kilowatt hour, compiled according to computations made for electric power plants not yet put into operation, and according to statistical data collected from plants operated in 1958, are to be found in Table 8, items 43 and 44. If we designate the unstable unit heat consumption as q' and the optimum unit heat consumption as q, we obtain the following formula

$$q' = q \times \delta \times \delta'$$

where δ = loss factor due to the load rating deviating from the optimum load, which also takes into account the starting and stopping of the equipment assemblies. Owing to the lack of our own calculations and measurements, we made use of Siemens charts, which furnished the following result:

δ = 1.10 at a 4,000-hour annual utilization of installed power
δ = 1.07 at a 5,000-hour annual utilization of installed power
δ = 1.05 at a 6,000-hour annual utilization of installed power
δ'= loss factor resulting from the dirt accumulated on the surface of the turbine condensers and boiler heating surface, deviation of the actual efficiencies from the rated ones, etc.

From the statistical operating data for 1958 it results that, the above coefficient varies within the limits of:

$$\delta' = 1.04 \text{ to } 1.12$$

depending on the furnisher of the equipment and operating level of the electric power plant. It is to be assumed that in the future this coefficient will vary within the limits of:

$$\delta' = 1.04 \text{ to } 1.08$$

Table 8

Basic Technical Data on Public Utility Thermal Power Plants of Over 40 Megawatts, as Planned by "Energoprojekt" and Approved for Construction in 1949-1959

		Zabrze	Stomhier[illegible]	Miechowice
1	Number	1	2	3
2	Approval of preliminary plans (year)	1950	1951	1950
3	First turbogenerator set in operation (year)	1952	1956	1952
4	New (N), expanded (R), restored (O)	OR	OR	O
5	Installed power (megawatts)	481	444	220
6	Electric power production (E), heat (C), steam for industrial purposes (P)	E	E	E
7	Steam pressure before turbine (atmospheres)	56	36	65–68
8	Fresh steam temperature before turbine (°C)	[illegible]	490	520
9	Secondary superheat steam temperature before turbine (°C)	—	—	—
10	Fuel: bituminous (K), brown coal (B), waste (O)	K	K	K
11	Aver. lower heat value (kcal/kg)	5300	5200	5000
12	Capacity of coal storage facilities (days)	.	.	4
13	Capac. of coal bunkers in boiler room (hrs)	13	16	24
14	Capac. pulverized coal bunkers " " (hrs)	3,5	—	5
15	Planned coal crushing (K)	—	—	—
16	Pulverizer type: central (C), drum-ball (K), crushing (M), fan type (W), beat (B)	K	B	K
17	Number of pulverizers per boiler	2	3	2
18	Number of boilers	4	7	9
19	Economic output of boiler (tons per hour)	105	70	105
20	Maximum continuous output of boiler (t/h)	130	78	120
21	Boiler efficiency under economic load conditions (guaranteed), in percent	82	86	87
22	Efficiency of exhaust fume collectors (%)	97/92	98	.
23	Preparation of addnl boiler water: chemical (Ch), evaporation (W), demineralization (D)	Ch	Ch+W	Ch+W
24	Preheat temp. regen. condensation water (°C)	190	170	195
25	Degassing temperature (°C)	160	150	165
26	Capacity of feedwater tanks (minutes)	28	15	20
27	Number of turbogenerators	2+1	1+1	4
28	Economic capacity of turbogenerators (mw)	28–12	28–9	46
29	Max. cont. capacity of turbogenerators (mw)	35–11	35–9	55
30	Turbine type: steam condensing (K), bleeder (U), back-pressure (P)	K–P	K–P	K
31	Cooling system: closed circuit (Z), open (O), ponds (S)	Z	Z	Z
32	Computed cooling zone of cooler (°C)	37/27	37/27	27/27
33	Aver. ann. temp. of cooling water (°C)	.	.	.
34	Cubature of main building (m^3/kw)	1,20	.	1,27
35	Area of fenced elec. plant grounds (ha)	—	—	17
36	Utilization of installed power per year according to design (hours)	7000	5500	6650
37	As above, for 1958 (hours)	6970	6730	6700
38	Power in operation, 31 Dec 58 (mw)	81	44	220
39	Planned power plant consumption (percent)	5,7	8,5	[illegible]
40	As above, for 1958 (percent)	5,6	8,8	6,1
41	Unit heat consumption of turbogenerator under economic load conditions (kcal/kwh)	2530	2530	2420
42	Optimum unit heat consumption per kwh planned net (kcal/kwh)	2250	3340	[illegible]
43	Unstable unit heat consumption per kwh, computed net (kcal/kwh)	—	—	—
44	As above, for 1958 (kcal/kwh)	3971	4060	3556

[Table 8 continued]

	[illegible]	Jaworzno II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.	4	5	6	7	8	9	10	11	12	13	14	15
2.	1951	[illegible]	1950	[illegible]	1951	1951-52	1950	[illegible]	1973	[illegible]	[illegible]	1955
3.	[illegible]	[illegible]	1956	1951	1958	1952	1955	1955	[illegible]	[illegible]		1977
4.	H	N	H	A	H	R	O	N	K	N	N	O
5.	[illegible]	[illegible]	250	126	62	455	119	78	110	500	200	220
6.	E	E	[illegible]	E	EC	E	E	EP	E	E	E	E
7.	[illegible]	[illegible]	[illegible]	70	28	36	52	26	[illegible]	[illegible]	[illegible]	96
8.	[illegible]	[illegible]	300	[illegible]	430	435	490	43	[illegible]	500	[illegible]	[illegible]
9.	—	—	—	—	—	—	—	—	—	—	—	—
10.	K	K	K	K	K	K	K	K	K	K	K	K
11.	[illegible]	[illegible]	5057	[illegible]	[illegible]	[illegible]	5075	[illegible]	5450	3900	3900	5000
12.	—	[illegible]	[illegible]	19	21	36	45	15	26	20	10	12
13.	—	19	27	25	5.5	22	—	20	13	5,5	3,5	34
14.	6	4.5	7		—	—	5.8	—	[illegible]	2,7	2,7	
15.	—	K	[illegible]	—	—	—	—	K	[illegible]	K	K	K
16.	KC	K	K	KC	B	N	KC	B	K	K	K	M
17.	—	[illegible]	—		3	[illegible]		3	2	2	2	4
18.	4	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]	4	4	7	4	8
19.	[illegible]	[illegible]	[illegible]	160	105	155	125	80	[illegible]	150	210	100
20.	[illegible]	[illegible]	[illegible]	125	130	130	170	20	[illegible]	[illegible]	210	120
21.	63 64	48	67	55	56	54	86	83	86	87	[illegible]	88
22.	[illegible]	[illegible]	96 97	35	87	87	90 90	[illegible]	85 80	92	[illegible]	97 97
23.	Ch+W	Ch+W	Ch	Ch	Ch+W	Ch+W	Ch+W	Ch	Ch+W	Ch+W	Ch+W	D
24.	182	215	215	130	155	160	208	125	205	215	215	215
25.	175	145	160	[illegible]	120	106	169	125	205	150	175	155
26.	[illegible]	29	26	30	35	40	30	35	30	20	26	27
27.	2	6	[illegible]	3+2	2+1	4+1	2	1+2	2	2+2	2	4
28.	26	[illegible]	25	8 [illegible] 12	20 12	20 5	6	12 26	40	57 100	103	56
29.	35	56	39 15	[illegible]	25 12	[illegible]	55	16 25	55	[illegible] 109	150	55
30.	K	K	L	K I	K U	K P	K	K	K	K	K	K
31.	Z	Z	O	Z	O	O	Z	O	C+Z	C+Z	C+Z	Z
32.	17 27	35 5/26		21/33			37/19	—	37/[illegible]	43/33	43/33	51/27
33.	—	[illegible]	26	—	15	[illegible]		12	20	10	10	
34.	—	1.42	1.88	2 [illegible]		1 [illegible]	0,74	1.41	1,27	1,23	0.91	1,45
35.		42	25				12	27	[illegible]	36	—	—
36.	7090	3500	6070	6400		6350	5159	6000	7005	6000	6300	6400
37.	6956	7120	7025	5000	3000	4800	[illegible]	4070	4060	5405	—	4145
38.	70	206	226	120	[illegible]	56	116	13	110	201		255
39.	7,2	[illegible]	12,9	6 [illegible]		7,0	15,6	4,6	8,2	6,8	2.5	6.8
40.	7,3	21,0	20,0	8 2	10.3	7,9	9,6	8,8	7,7	11,7	—	[illegible]
41.	2500	2280	—	2462	3600	7800	2461	2500	2390	2252	2130	2760
42.	3440	3100	—	3200	3670	—	3320	.	3310	3000	2770	2800
43.	—	—	—	—	—	—	—	—	—	—	5100	—
44.	3717	3293	3332	3752	4033		3663	3939	3672	3593	—	3024

[Table 8 continued]

	Łazis-ka II	Konin I	Ko-nin II	Biel-sko	Pomo-rzany	[illegible]chow-nia II	Sie-kierki	Turów	Sier-sz? Wodna ??	Łagi-sza	Ma-lemba	Konin III	Ada-mów
1.	16	17	18	19	20	21	22	23	24	25	26	27	28
2.	1953	1952	1957	1955	1956	1956	1957	1958	1958	1958	1958	1958	1969
3.	1958	1958	—	—	—	—	—	—	—	—	—	—	—
4.	N	N	N	N	O	OR	N	N	N	N	N	N	N
5.	150	165	+150	50	150	+140	205	1260	260	500	205	+250	500
6.	ECP	E	E	EP	E	E	EC	E	E	E	E	E	E
7.	90	69	96	96	141	181	90	136	127	127	90	127	127
8.	500	496	535	500	525	530	535	535	540	539	535	535	535
9.				--	525	525		535	540	520	—	535	535
10.	K	B	B	K	K	K	K	D	K	K	KO	B	B
11.	4800	2750	2050	4740	5000	5000	4800	1800	4000	3950	4135	2050	2040
12.	15	1	1	16	111	15	22	0,5	10	14	15	λ	1
13.	26,7	18	10	26	22	30	10	7	14	14	19,3	6 - 8	6
14.	—	—	—	—	—		5	—	—	—	—	—	—
15.		K	K	—	—	K	K	K	K	K		K	K
16.	W	W	W	W	M	M	K	W	M	M	M	W	W
17.	3	4	4	3	4	4	2	8	5	6	4	6	6
18.	8	6	3	3	2	3	4	6	2	4	4	2	4
19.	95	105	186	95	160	190	185	550	369	·	175	365	305
20.	120 130	130	236	159	206	237	330	650	403	385	215	350	380
21.	86	53	80	86	90	90	-	87,5	85	90	89	87,5	87,5
22.	98	94	92	97	95	92	97	95	85	95	97	92	95
23.	D	Ch+W	Ch+W	D	D	D	Ch	D	D	D	D	Ch+W	D
24.	215	205	215	215	275	250	215	240	236	225	215	226	231
25.	150	160	160	150	160	138	160	155	162	105 119	160	105 - 119	105 - 119
26.	20	22	35	25	31	25	17	12	12	13	19	10	10
27.	4+1+1	3	3	2	2	2	1+1	6	2	4	4	2	6
28.	35 25 20	44	50	25	50	60	50—55	250	120	120	40—50	120	120
29.	25 30 20	65	50	25	60	70	50 - 30	200	180	125	50	120	126
30.	U U P	K	K	U	K	K	K U	K	K	K	K	K	K
31.	Z	S	S	Z	O	Z	O	Z	Z	Z	Z	Z	Z
32.	27 17	—	—	37 27		32,5 24		37/27	33/24	33/25	32,5/25	33/24	33 24
33.	·	13	15	·	12	·	10	·	·	·	·	·	·
34.	7,32	1.49	1,17	3,63	0,56	0,88	1,02	0,64	0,74	0,78	1,08		0,63
35.	17	27	—	15	20	—	34	34	34	37	24		37
36.	6600	6100	6500	6000	6000	700	5800	7200	7000	7000	6300	3500	7000
37.	2130	3558	—		—		—	—	—	—	—	—	—
38.	75	100	—		—		—	—	—	—	—	—	—
39.	16,7	8,5	8,5	19,5	7,4	6,9	11,5	8,9	6,7	7,6	8,8	7,1	7,0
40.	13,1	8,6	—	—	—	·	—		—	—	—	—	—
41.	·	2320	2250	—	1939	2821	—	2135	1966	2020	2325	2010	2020
42.		3150	2950	—	2440	2460	—	2890	2500	2480	2390	2530	2530
43.		—	2320	—	2570	2640	—	2810	2600	2660	3300	2740	2740
44.	3399	2521	—	—	—	—	—	—	—	—	—	—	—

20. Conclusion

The progress made in the planning and construction of electric power plants during the past decade is very significant from the quantitiative as well as qualitative viewpoints. The present planning level of electric power plants has been achieved by the "Energoprojekt" to a large extent, thanks to the assistance of "Eiploielektroprojekt," Leningrad branch, with which the "Energoprojekt" cooperated in planning a number of large projects. The assistance of Czechoslovak enterprises in the planning of the first postwar projects based on deliveries from Czechoslovakia, and some assistance obtained from Berlin in the planning of the brown caol operated electric power plant in Konin should also be mentioned.

The further expansion of power engineering will be based primarily on deliveries of the domestic industry, inspite of the fact that the links with foreign planning institutions and furnishers will be maintained. The trained and specialized planners and designers gathered at the "Energoprojekt" in Warsaw and in its Katowice and Gliwice branches have acquired sufficient experience to prepare independently the documentation for electric power plants as required by the power industry, and according to the present engineering requirements.

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POLAND

Economic Briefs

Celebrations in the "Nowa Huta" Cement Plant

As we informed in the Septemberissue of our monthly, the cement plant--or more correctly, as of now--only the grinding facilities of "Nowa Huta," so-called because of its close proximity to the "Lenin" Foundry, was officially turned over for exploitation.

This occasion was celebrated on 12 September of this year. Master Engineer Stefan Pietrusiewicz, the Minister of the Construction and Construction Materials Industry, was present, and among the numerous guests was Mr J. Hegen, Ambassador from the German Democratic Republic, from where we received part of the equipment for the new factory.

After Minister Pietrusiewicz cut the symbolic ribbon at the entrance to the plant, the invited guests got acquainted with the installations of the festively decorated factory. They all praised the practical location of particular units and the equipment contained therein. Attention was called to the fact that all machines, as well as the ahlls and factory yards, were spotlessly clean, undoubtedly the excellent dust catching installations contributed much to this; however the youthfull crew sna management of the grinding mill contributed to an even greater degree.

In turn, after visiting the plant, the guests--among whom were delegates of all cement factories belonging to the Cement Industry Association--went over to the folk theatre of "Nowa Huta," where the festivities were held. The festivities consisted of speeches, the first speaker being Master Engineer Girtler, the director of the construction enterprise that erected all the factory and administrative buildings. Next, after a speech by the plant director, Master Kazimierz Cichon, Minister Pietrusiewicz took the floor, he thanked the builders for finishing all the units on time and the plant management for the succesful coordination of the installation work with the construction work. He spoke, among other things, about the role of the cement industry in the over-all national economy and, in connection with this, about the great significance of delivering an additional production plant.

The culminating point of the festivities was the awarding of National prizes to the most deserving workers in the construction of the cement plant, led by Director Master Girtler and followed by Master Kazimierz Cichon, the plant management director; Dislaw Rutkowski, Director of Economic Affairs; Engineer Brycha Director of Investment Affairs; and Bronislaw Dura, the Chief Mechanical Engineer.

In customary fashion, the entertainment part of the festivities followed the official part. The artistic program consisted of performances by performers from Krakow.

A joint dinner finished off the day of celebrations for the entire cement industry and particularly for the crew of the "Nowa Huta" Grinding Mills, which, since starting the plant until 12 September had produced 185,000 tons of blast furnace cement.

(Cement, Wapno, Gips, Vol XV?XXIV, No 10, October 1959, Warsaw, pages 282-283; CSO: 3739-N/b)

* * *

The Smoke Stacks of the "Chelm" Cement Plant Will Become Active Soon

We mentioned in this column that the"Chelm" Cement Plant in Chelm, Lublin region, was in the last phase of construction. One of the largest units of our cement industry, which should produce 46,000 tons of cement in the first year of its activity (six months of 1960), will be constructed in a relatively short time--not quite 3.5 years--considering our difficulties in finding the necessary manpower and the nonpunctuality of our domestic suppliers. The number of workers employed in this plant testifies to the magnitude of work carried out in this cement plant and to the equipment connected with it.

(Cement, Wapno, Gips, Vol XV/XXIV, No 10 October 1959, Warsaw, page 283; CSO: 3739-N/b)

* * *

The Socialist Countries Feel the Lack of Cement

The role construction plays in the economies of large and highly industrialized countires as well as in the economy of smaller and economically weaker countries is well known.

Therefore, the consumption of cement, recalculated per inhabitant, and the need for this construction material on the domestic market is one of the coefficients according to which the viability of the economic development of these countries is evaluated. We mention this well known fact in connection with the following news item--namely that a number of countries of the socialist camp, such as Bulgaria, Czechoslakia, East Germany, Poland, and Hungary, intend to buy abroad considerable quantities of cement because their own production does not satisfy the needs of their domestic consumers. Our representatives of foreign trade, for example, have bought 120,000 tons of cement in Denmark.

(Cement, Wapno, Gips, Vol XV/XXIV, No 10, October 1959, Warsaw, page 283, CSO: 3739-N/b)

* * *

Production Results of the Cement Industry in August and September of the Current Year

The cement industry continues to obtain favorable results. The plan for August foresaw a cement production of 445,100 tons. A surplus of 16,838 tons amounts to 3 percent of the plan for this month.

All plants have contributed to the success of the industry, particularly "Groszowice," "Odra," and "Wierzbica."

The September balance is also favorable for our cement industry. The quantity of 426,450 tons foreseen in the plan was exceeded by 6,229 tons.

All told, during the third quarter of the current year the surplus in cement production, in relation to the annual plan, amounted to 32,000 tons, worth 12 million zlotys.

The cement production surplus during the first three quarters of the current year amounts to a considerable quantity--179,000 tons of cement worth 67 million zlotys.

The industry achieved such favorable results because of the obligations the cement plant crews accepted on the occasion of the Holiday of Labor and the one-thousand-year school construction drive, the favorable weather conditions during the first quarter of the year also had a considerable influence.

For the sake of exactness, we must add that the changes in the timetable for annual repairs, which were moved to the fourth quarter in several cases, this year also contributed to the achievement of the discussed surpluses.

This last fact will undoubtedly influence the production results of the industry in the last threee months of the year. The plants which have shifted the repair schedule to the last quarter may have difficulty in fulfilling the production plans in this period, and this will undoubtedly influence the over-all production results

(Cement, Wapno Gips, Vol XV/XXIV, No 10 October 1959, Warsaw, ~~pages 283-284; CSO~~: 3739-N/b)

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Our Lime and Gypsum Industry in the Role of an Exporter

Amont the domestic industries that produce binding materials only the cement industry has a tradition. Sacks of cement with Polish inscriptions have been and are still unloaded in many foreign ports, during the prewar period as well as since the first years after the end of the Second World War. Our lime and gypsum industry does not have this tradition. Therefore, we must accord even greater recognition to the efforts of the management of this industry and of "Minex" [Ministry of Export] in obtaining foreign customers for lime, dolomite, and lime powder as well as raw gypsum and products made of the latter.

Although the present export of these articles comprises a very small part of the production of the above-mentioned industries and plays even a smaller part in our exports, it nevertheless deserves to be mentioned to our readers.

In the past year we exported to East Germany 7,000 tons of limestone and 390 tons of fired lime. At the same time the following countries bought gypsum from us: Sweden, 14,538 tons;

Norway, 4,865 tons, and Finland, 20,910--a total of 40,313 tons. We supplied Finland with 2,125 tons of gypsum for artistic purposes, and Sweden with 4,220 tons of plaster panels from the "Dolina Nidy" combine. The value of this export amounted to not quite 5 million zlotys--thus around 170,000 American dollars.

That the export of these materials is developing successfully is attested to by the data from the first half of the current year--fired lime found customers in the following countries: East Germany, 84 tons; Holland, 2,040 tons, East Germany also bought 3,209 tons of lime powder from us. We supplied raw gypsum to the following countries: Hungary, 1,448 tons; Norway, 2,530 tons; Sweden, 12,440 tons; Denmark, 13,745 tons; and Finland, 19,449 tons. During six months we sold to foreign customers a total of 49,611 tons of gypsum stone.

We sold gypsum sheets--so-called dry plasters--to the following countries: West Germany, 1,316 tons; Austria, 1,500 tons; Sweden, 25,619 tons; and iceland, 27,559 tons. The total export of gypsum sheets amounted to 55,994 tons during the above period.

Besides that, we sent 1,475 tons of gypsum for artistic purposes to Finland and 656 tons of dolomite to Czechoslovakia.

The total value of the exports of the above-mentioned materials amounted to 7,957,914 zlotys--thus about 206,520 American dollars.

It is obvious that the most profitable export items are the gypsum sheets (dry plasters). Their production is limited by the quantity of cardboard supplied to the "Dolina Nicy" combine.

It is possible that as the export of these panels increases the import of cardboard may become profitable.

(Cement Wapno, Gips, Vol XV/XXIV No 11 Novemeber 1959, Warsaw Page 316; CSO: 3740-N/b)

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Prospects for the Export of Raw Gypsum

The numerical data pertaining to the export of raw gypsum is a supplement to the information given above. They are as follows in the last few years: in 1956 we exported 90,000 tons (cooperatives were the exclusive exporters) and in 1957, 185,000 tons, wherein the share of the nationalized industry was 40,000 tons; 1958 was marked by a certain drop in gypsum stone export--it amounted only to 160,000 tons, wherein share of the cooperative organizations accounted for about 120,000 tons.

It is foreseen that in the current year the sales of raw gypsum to foreing customers will be about 175,000 tons, of which werein the nationalized industry will ship about 90,000 tons.

It is planned that the export of raw gypsum will reach about 209,000 tons in 1960, of which 100,000 tons will be supplied by the nationalized gypsum industry,

(Cement, Wapno, Gips, Vol XV/ XXIV, No 11 November 1959, Warsaw, page 316; CSO: 3740-N/b)

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INTRA-BLOC

Resume of the Establishment, Organization, Accomplishments, and Current Projects of the OSShD

[This is a translation of an article by Magister Stanislaw Podwysocki in Przeglad Kolejowy-Przewozowy, Vol XI, No 12, December 1959, Warsaw, pages 312-314, CSO: 3747-N/b]

The development of international hauls of passengers and goods in the postwar period between the people's democracies gave rise to the necessity of concluding proper agreements which would facilitate the execution of these hauls.

As a result of an agreement of interested railraod administrations and the preparation of proper plans, on 1 November 1951 agreements on the international passenger transport (SMPS) and freight transport (SMGS) were introduced; based on them were passenger fares and freight rates, rules on the use of cars, and accounting provisions.

The first permanent body which dealt with the problems of the above-mentioned agreements, fares, rates, and rules, was the Administrative Bureau for the Affairs of SMPS and SMGS, created in 1951 with headquarters in Warsaw, known as BUD. It was no accident that the first stage of cooperation of the railroads of individual countries encompassed the problems of hauls, fares and freight rates, and turnover of cars, because these problems are among the most vital in the management of all railroads, and without their regulation on an international scale excessive difficulties would be encountered.

On 1 January 1956 the scope of BUD work was extended to include certain technical problems, at the same time expanding the specialist personnel of that bureau from four to seven experts, with the PKP [Polskie Koleje Panstwowe; Polish State Railroads] providing only two and the remaining railroads five. In this form the Administrative Bureau for the Affairs of SMPS and SMGS worked only about a year and a half, because by 1 September 1957 it was liquidated and the functions of the BUD were taken over by the railroad transport committee of the Organization for Railroad Cooperation (Organizacja Wspolpracy Kolei), which started working at the same time.

The members of the Organization for Railroad Cooperation, known as OSShD, are the railroads of the following countries: Albania, Bulgaria, China, Czechoslovakia, Korea, Mongolia, East Germany, Poland, Rumania, Hungary, Vietnam, and the USSR.

The activities of the OSShD are based on the statutes of that organization defining its basic tasks, among which are: problems of agreements of international passenger and freight transport and related provisions and instructions; preparation of fares and freight rates; organization of work on the planning of international hauls and formation of routed trains; improvement of work of frontier stations; solution of problems of economical utilization of cars; improvement in speed of trains and in timetables; organization of scientific and technical cooperation in the field of railroad transport; the problems of car dimensions; the problems of construction of railroad lines and rolling stock; problems of communication, signalling, and safety of travel; and also problems of traction.

The body directing the OSShD is the Conference of Ministers (Narada Ministrow) administering the railroad belonging to the organization. Sessions of the Conference of Ministers take place every year in turn in each of the countries whose railroads belong to the OSShD. The Conference of Ministers examines all the more important problems concerning the tasks of the OSShD, passing the proper resolutions; it confirms the program of work of the committee, accepts new members, and defines the organizational structure and activities of the railroad transport committee. The Conference of Ministers may empower the railroad transport committee to settle independently individual problems within the competence of the conference.

The executive body of the Conference of Ministers is the railroad transport committee which conducts the activities of the organization between the sessions of the Conference of Ministers. The committee is composed of one representative of each railroad participating in the OSShD. The committee is headed by a chairman, deputy chairman, and secretary--all selected from the committee members and approved for these posts by the Conference of Ministers. In addition, the committee possesses a staff of experts (counselors) from various fields of railroad management, delegated to work with the committee by the Railroad Ministers of the individual countires, and a staff of translators, typists, and employees of the secretariat and of the editorial officers of Biuletyn OSShD.

Auxiliary organs of the committee are commissions created to cope with tasks faced by the organization in the field of individual branches of railroad work, and working groups of experts created as needed to work on specific problems. The statutes of the OSShD established the following commissions for the committee:

1) for affairs concerning the agreement on international passenger transport;
2) for affairs concerning agreement on international freight transport;
3) for fares, freight rates, and economic problems;
4) for operational problems and frontier station work;
5) for scientific and technical cooperation;
6) for problems of dimensions and of rolling stock;
7) for problems of signaling and communications and for safety of train traffic;
8) for problems of electrification and improvement of traction;
9) for problems of construction of railroad and engineering installations;
10) for coordination of the activities of OSShD member railroads in other international organizations dealing with the problems of railroad transport;
11) for motor transport and roads.

The last of the above-mentioned commissions has been functioning since 1 January 1959.

As follows from the list given above, expert work in almost all fields of railroad economy is concentrated in the commissions, while the committee, in accordance with its rules, fulfills functions of a more general nature, such as preparation of sessions of the Conference of Ministers; direction of the activities of commissions and approval of their resolutions; supervision over punctual execution by the railroads of the resolutions of the Conference of Ministers; solution, by agreement with the interested railroads, of controversial problems; publication of the Biuletyn OSShD; cooperation with other international railroad organizations, etc.

The committee solves problems of the collegium during its meetings, passing appropriate resolutions. Resolutions on fundamental matters should be passed unanimously. Those accepted only by a majority of votes are of the nature of recommendations and are presented for final decision to the Conference of Ministers or in writing to all members of that conference. Unanimously accepted resolutions of the committee became valid if within two months of their passage there is no protest from any member of the Conference of Ministers.

The commissions consist of permanent delegates nominated by the individual railroad administrations. A chairman of the commission is as a rule a committee member or, in exceptional cases, a committee counselor nominated by the committee. Conferences of commissions are held once a year or once every two years, according to need, and the plan of conferences is approved by the committee. The commissions pass drafts of resolutions or recommendations, which are then approved by the committee. Problems on which no agreement was reached during conferences of commissions are also solved by the committee and if unsolved on this level too they go to the Conference of Ministers.

The official languages of all bodies of the OSShD are Chinese, German, and Russian. All materials and resolutions are prepared in these three languages, and in case of different interpretations clarifications are issued on the basis of Russian texts.

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Without dwelling on further organizational and procedural details of the OSShD, I wish to call attention to the results of the work of this organization during the two years of its existence. Although this was an organizational period, a period of introduction of new wide forms of international cooperation in almost all the fields of railroad management, it can be stated objectively that it has already given quite noteworthy results.

I will limit myself here to listing the achievements of the first four commissions--that is the trade and transport commissions--because their work is of greatest interest to the employees of the haulage service. As we already know, the agreeemtns on the international passenger and freight transport (SMPS and SMGS) and the service rule and instructions based on them have been valid since 1951. Also since that time, uniform transit freight rates (ETT) have been used, playing an important part in the field of facilitating international exchange of goods. It is possible to mention here that the West European railroads, despite several years of work, did not as yet succeed in introducing such rates. But economic life and international turnover develop at a rapid pace and make it necessary for the rialroads to supplement and improve the existing provisions and freight rates. As a result of the preparatory work and conferences of the commissions, it was possibel in the course of the last two years to prepare permanent texts of agreements on international passenger and freight transportation (SMPS and SMGS), which will be valid together with the suitably corrected service instructions as of 1 January 1960. Important simplifications were introduced in the uniform transit freight rates, introducing at the same time several hundred new products. The new issue of these rates became valid on 1 January 1959. A new text of rules on settlement of accounts for the above-mentioned agreements and a new text of rules on the use of cars in international transport were prepared. The new texts are much more extensive and they remove all the noticed shortcomings in the practical application of the rules. They will become valid, like the other agreements, on 1 January 1960. In addition, for the second year running, routes of international trains are being prepared, whose purpose is to facilitate hausl and to direct them on the most economical routes. For the transportation of passengers, the draft of uniform international passenger fares (EMPT) was prepared, which will probably become valid in 1960. The fares are expressed in current rubles, which, for the purpose of international settlement of accounts, can be converted into clearing rubles with the aid of a coefficient which will be determined ruing a conference of the representatives of the financial bodies of all the interested countries. The new uniform international passenger fares are to replace the current three group fares in which all the OSShD member railroads participate.

Apart from the above-mentioned already completed projects, it is possible to list here several additional problems on which studies have been started and drafts are under preparation. These are problems of new product definitions for ETT; the problem of differentiation of ETT rates according to distance of haul and weight of shipments; the problem of unification of the structure of internal freight rates of individual railroads; further, the problem of uniform method of calculation of the cost of production of transportation of passengers and freight by the individual railroads; uniform method of definition of more important operational indicators on these railroads; unifications of certain decisions of PET and of instructions on the direction of train movement; the introduction of uniform principles, and others. The drafts for the settlement of the above problems are being prepared either by railroad administrations which undertook this work on the recommendation of the committee, or by employees of the committee itself. The drafts are sent to all the railroads for study and remarks are then corrected and completed during conferences of groups of experts. After being analyzed and approved by the railroad transport committee and after the passage of two months, they are implemented in the nature of either obligatory decisions or recommendations. Decisions of fundamental importance are subject to approval of the Conference of Ministers.

Serious and useful achievements have also been attained by the remaining commissions of the CSShD committee; thus Commission 5 in the field of coordination and dividion of scientific research work in the field of railroads, Commission 6 in the field of unification of dimensions of the rolling stock of railroad lines, Commission 7 in the field of construction and modernization of international telephone and telegraph communications, etc. Although the results of this work will also be useful for the haulage service, I will not discuss them in detail here because basically they are of interest to other services.

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INTRA-BLOC

Meeting of OSShD Commissions Concerned with Railroad Communications and Signaling

[This is a translation of an unsigned article in Przeglad Kolejowy, Vol XII, No 1, January 1960, Warsaw, page 39; CSO: 3753-N]

A meeting of railway communication experts, participating in the OSShD met in Moscow from 29 June to 6 July 1959. Representatives of ten railway administrations took part in the meeting. The main topic of the meeting was the improvement and expansion of the international communications network, telephone, and telegraph, which has already been in existence for several years, and improvement of the network maintenance organization, exchange of telegrams, and the like. It was established that over the last year there was a considerable improvement in the state and scope of mutual telephone and telegraph communications. Thus, for example, new railway telephone connections between Warsaw and Ulan Botor and between Warsaw and Peking were established during this period.

In order to obtain railway telephone connections between Warsaw and Budapest, Bucharest and Sofia, as well as between Warsaw, Phoenan, and Hanoi and also between Moscow and Sofia, it was recommended to the interested railway administrations that they carry out indispensable, concretely described jobs, such as four-lead connections in their communication centers instead of the two-lead ones; the substitution of new leads of higher electrical values for the old ones on some sectors of the line; replacement of old apparatuses with modern equipment, with particular emphasis on high-frequency equipment; and the installation of 30-unit CB connectors of USSR production. Besides that, the organization of certain by-pass lines for use in case of breakdown of the main lines was discussed. For telephone connections, where 24-hour service would not be desirable at present for economic or technical reasons, a schedule was worked out which was put into use on 1 September 1959. A uniform telephone numbering for certain service units, repeated in all railway administrations, was adopted.

Resolutions similar to those for the telephone lines were enacted for the telegraph network. Twenty-four-hour service was established for them as a principle. The gradual introduction of modern teletype equipment, instead of old slow-working apparatuses, particularly morse equipment [was recommended]. The tendency to use high-frequency equipment was marked here too.

The final draft of rules for maintaining international railway telephone networks and rules for the exchange of telegrams over the international railway telegraph network of the OSShD members was discussed and adopted at themeeting. These rules go into effect on 1 January 1960.

The maintenance rules discuss the organization of the communications service, designate certain technical values, and establish the kinds and methods of testing in the maintenance of the telegraph networks the specificity of Baudot apparatus was also considered, the latter being widely used, particularly in the eastern part of the network.

Moreover, the problem of introducing radio and television in the work of railroads as well as the problem of effects (interference) of electric current on communication lines on electrified sectors was discussed at the meeting.

A meeting of the Commission for Signaling and Safety Devices in train traffic was held in Warsaw from 17 to 30 September 1959. Almost all railroads participating in the OSShD had their representatives present. Moreover, two specialists from the UIC [not identified] participated as guests.

Outlines for the design and construction of electrical centralization installation were discussed and adopted. These outlines, containing sic chapters, were worked out with the newest technical achievements in mind; use was made of electronics, noncontact magnetic elements, and the like. These regulations, as well as the ones in the field of communications, will be published by the committee and sent to railroads requesting them.

The resolutions adopted at the meeting pertaining to modern signaling were of decisive significance for the further development of railroad signaling. The commission found it possible and desirable, after a year of trial runs conducted by several railway administrations, to introduce blinker signals that have two different frequencies (40-60 and 100-120 flashes per minute), to signal four average velocities (v_1 = 40 kilometers per hour, v_2 = approximately 60 kilometers per hour, v_3 = approximately 90 kilometers per hour and v_4 =

approximately 110 kilometers per hour) between $v_0 = 0$ and v_{max} = up to 160 kilometers per hour. The indicators on the light signal to the sector which is being left (lower indicator) as well as to the subsequent sector (upper indicator).

Not all railway administrations agreed to the rapid introduction of the above signaling system. It was therefore decided that the remaining railroads would in the meantime use the signaling of two average velocities, but within the framework of the established system.

The signaling of a passage at velocities v_2, v_3, and v_4 requires two lights and an additional signal. Since the adoption of this signal in a uniform way created difficulties, a group of experts was requested to work out this additional problem during the first half of 1960.

The new signaling will allow railroad traffic management at velocities of 160 kilometers per hour as well as good utilization of the railway tracks by different vehicle structures and under various traffic conditions. The step taken toward standardizing signal indications is also of importance; it is of particular significance for signaling on transit lines.

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